THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1914.] LONDON, JANUARY 16, 1900. [52ND YEAR. PRICE 6d.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
The Wallsend & Hebburn Coal Company, Ltd.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

— ESTABLISHED 1830. —
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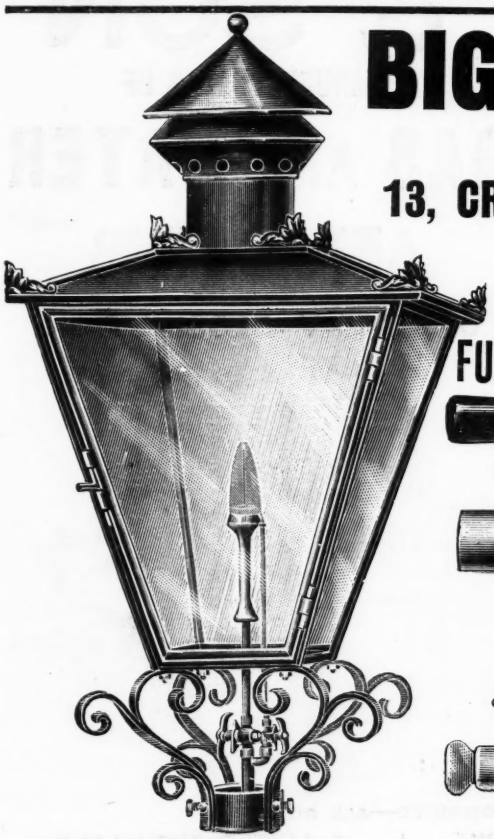
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT.
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

Wrought-Iron

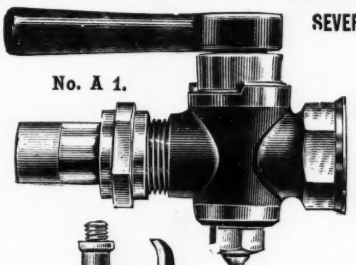
And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH.


The "DEMAND," REGISTERED

BIGGS, WALL, & CO.,
GAS AND WATER ENGINEERS,
13, CROSS STREET, FINSBURY PAVEMENT,
LONDON, E.C.

WRITE FOR OUR **PRICE LISTS** OF
FULL-WAY MAIN TAPS & LANTERN TAPS.
SEVERAL DESIGNS SHOWN BELOW.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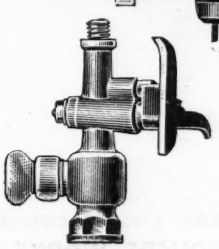
THESE TAPS ARE
FULL-WAY
AS SHOWN.

No. A.

SUPERIOR QUALITY AND FINISH IN GUN METAL.

LANTERN TAPS.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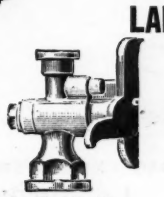
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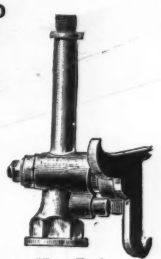
No. A 12.


No. A 1.

Specially constructed for New Incandescent Burner.

MAURICE GRAHAM.

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GRAHAM, MORTON & Co. LTD.

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SEE OUR ILLUSTRATED CATALOGUE

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RETORTS

ELEVATORS & CONVEYORS

Works; BLACK BULL STREET, LEEDS.

JOSEPH EVANS & SONS, WOLVERHAMPTON.

CULWELL WORKS,

PLEASE APPLY FOR CATALOGUE No. 8.

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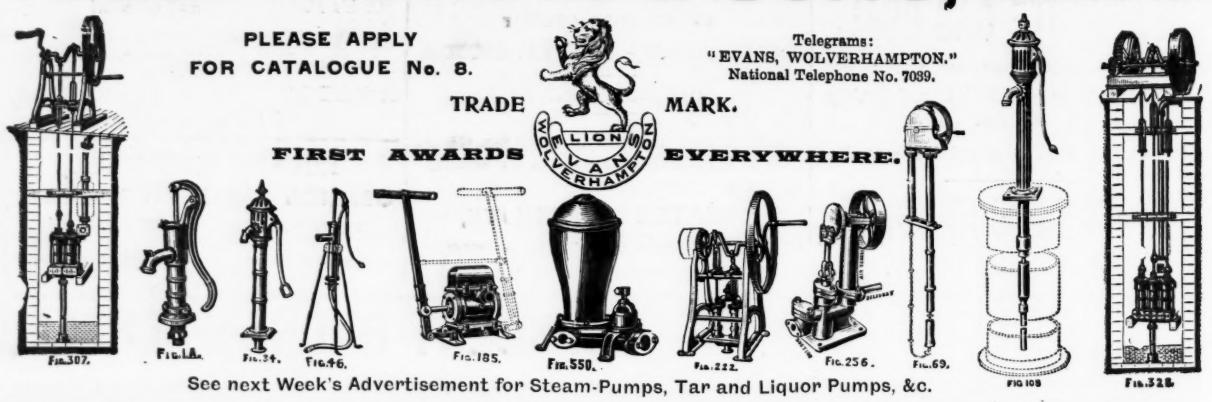

Fig. 307. Fig. 1A. Fig. 34. Fig. 46. Fig. 185. Fig. 550. Fig. 222. Fig. 256. Fig. 69. Fig. 109. Fig. 328.

See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

R. LAIDLAW & SON

ENGINEERS & IRONFOUNDERS.

MANUFACTURERS OF

CAST-IRON PIPES

ALL SIZES.

GAS AND WATER APPARATUS

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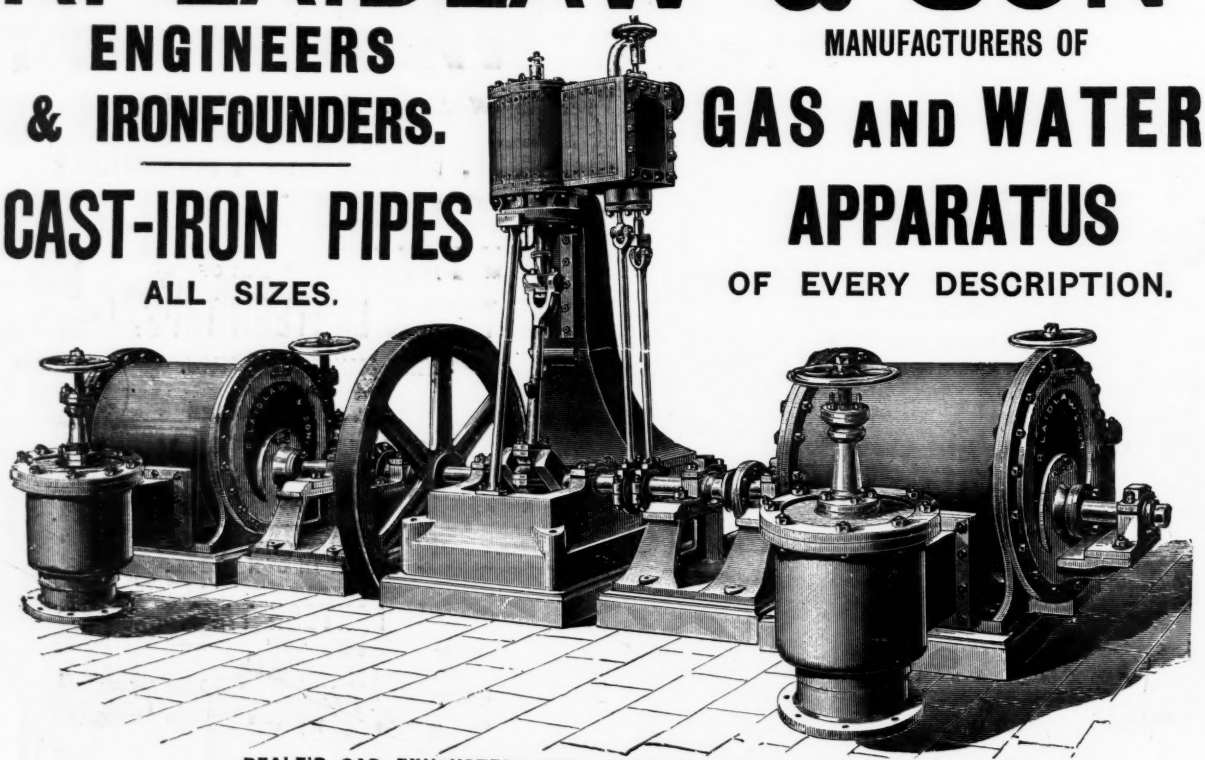

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ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

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Late LAIDLAW, SONS, & CAINE, Limited,

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Telegrams: "GASOMETER GLASGOW." GLASGOW.

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ROOFING OF EVERY STYLE.

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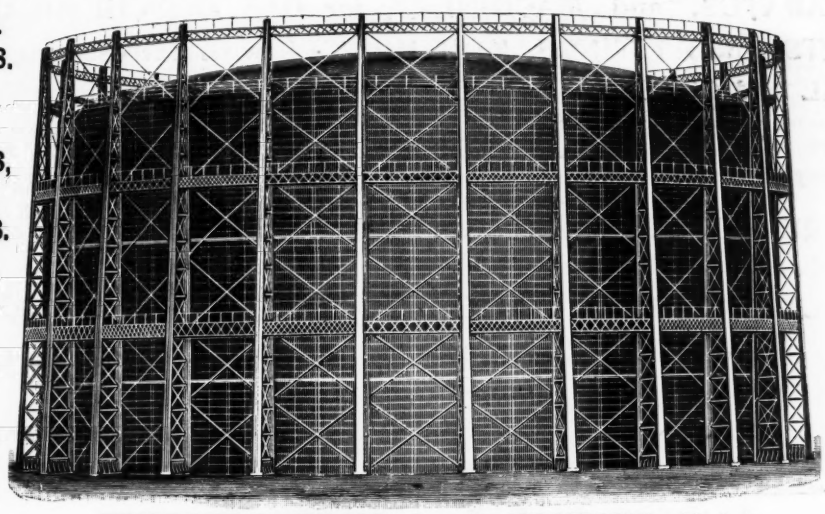

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RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.

THREE-LIFT GASHOLDER. Capacity, SIX MILLION cubic feet.
240 feet Diameter by 45 feet Deep each Lift. Erected at Glasgow, 1893.

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ATLAS METER WORKS, OLDHAM.

Manufacturers of

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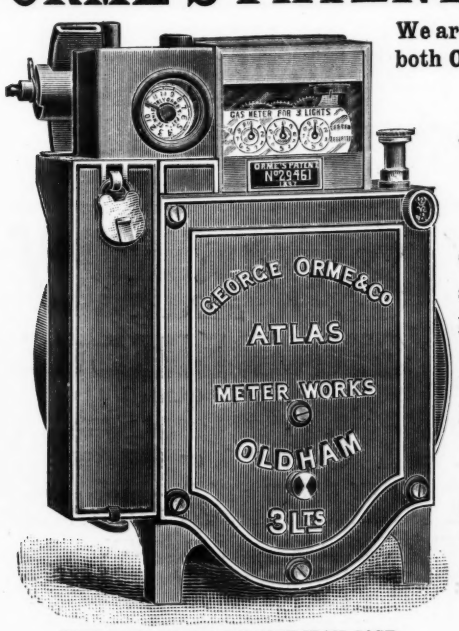


WET COIN METER IN CAST-IRON CASE.

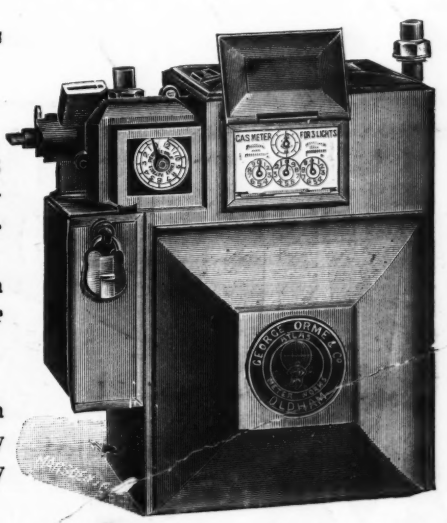
We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s.,** or any other Coin desired.

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



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Any further Particulars sent upon application.

Telegraphic Address: "ORME, OLDHAM." Telephone: No. 93, Oldham.

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Established 1790

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GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

Manufacturers of every description of

PLANT, APPARATUS, and MACHINERY for GAS and CHEMICAL WORKS.

RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS, CONDENSERS, SCRUBBERS, and WASHERS.

PURIFIERS with Planed Joints a Speciality.

Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

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GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders. GAS COAL famous for its UNRIVALLED EXCELLENCE.

FOR COKE BREAKING, ELEVATING, CONVEYING, SCREENING.

WRITE for PRICES and DESIGNS.

COAL

Conveyors & Elevators.

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Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

Gas Engineers and Contractors,

BALE & HARDY, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

BRAY'S

"SPECIAL" GAS-BURNERS.

SUITABLE FOR ALL PRESSURES AND CONDITIONS.

GEO. BRAY & CO.

GAS LIGHTING ENGINEERS,

BAGBY WORKS, LEEDS.

WORKMANSHIP and MATERIALS OF THE HIGHEST QUALITY.

PECKETT'S LOCOMOTIVES

Built to any Specification or Gauge.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

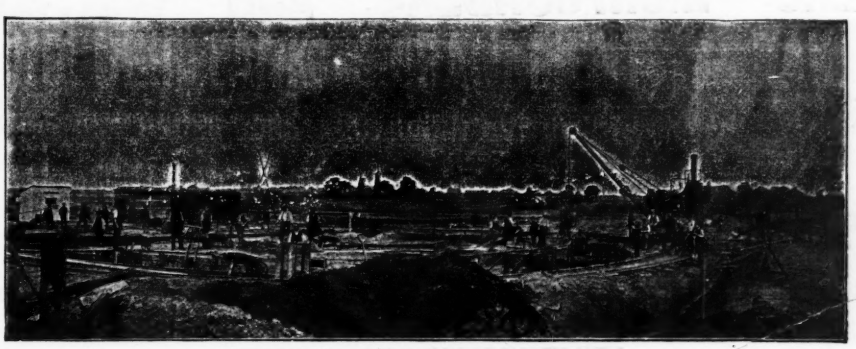
GASHOLDER TANK, EMBANKMENT, & RAILWAY

Telegrams: "Robustness, London."

UNDER CONSTRUCTION BY OUR OWN WORKMEN.

Telephone No. 756 Bank.

RESERVOIRS, TRIAL BOREHOLES and WELLS. MAIN and SERVICE LAYING.



COMPLETE GAS and WATER WORKS ERECTED and SET to WORK including ALL MAINS.

J. & H. ROBUS, Engineering Contractors,

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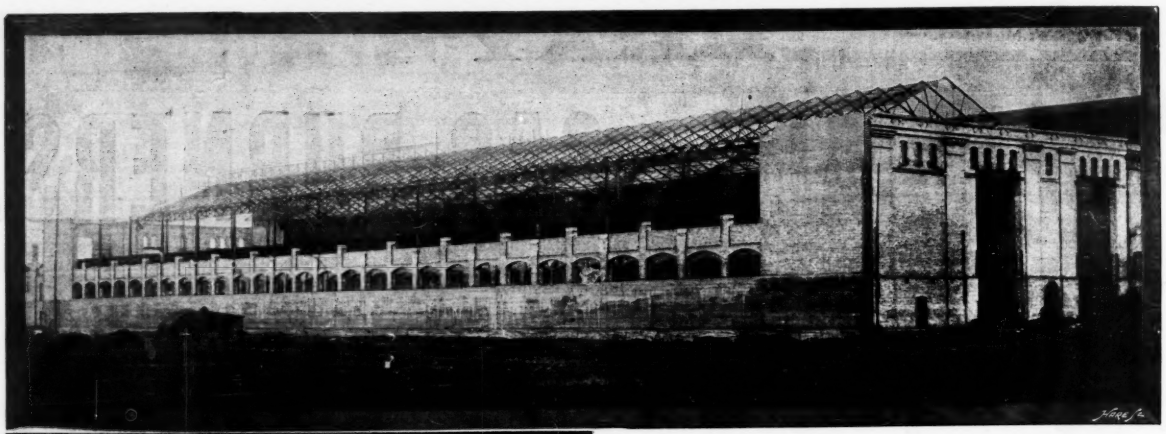
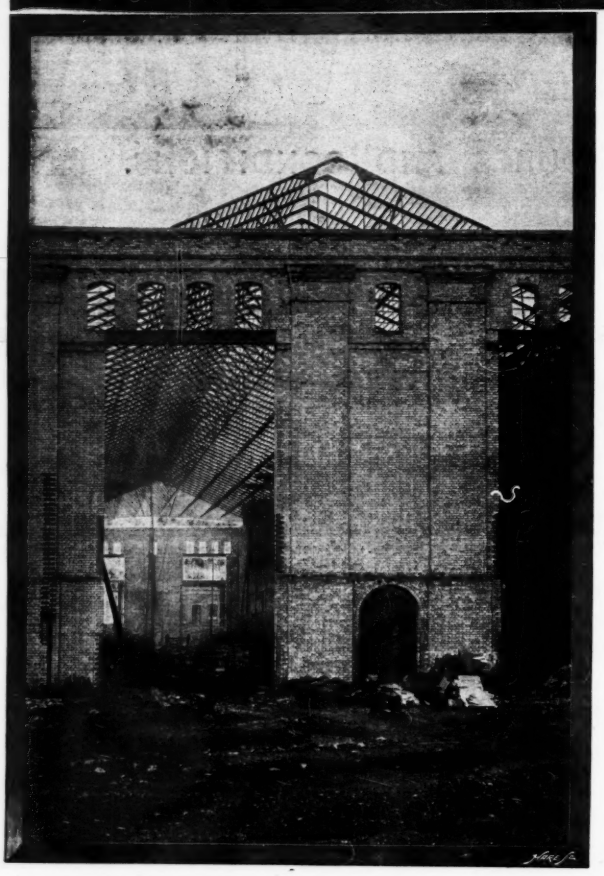
For Carbonizing Advt., see last Issue.





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Recently Manufactured and Erected

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RETORT-HOUSE

and

COAL-STORE

at the

EAST GREENWICH STATION

of the

SOUTH METROPOLITAN GAS COMPANY.

PLANS,

SPECIFICATIONS,

AND ESTIMATES,

ON APPLICATION

WILLEY & CO.,

ENGINEERS, IRONFOUNDERS, AND CONTRACTORS.

MANUFACTURERS OF GASHOLDERS PURIFIERS AND EVERY DESCRIPTION OF GAS PLANT OF ANY CAPACITY.

Station Meters, Wet and Dry Consumers' Meters, Prepayment Meters, Gas Apparatus, and Gas Fittings.

Also Bridges, Roofs, Columns, Girders, and Structural Iron and Steel Work of all kinds.

CHIEF OFFICES AND WORKS } **ST. THOMAS, EXETER.**

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METER-WORKS: 32a, Hertford Road, De Beauvoir Town, LONDON, N.; & James Street, EXETER.
OFFICES AND DEPOTS: CARDIFF: Prudential Buildings, St. Mary Street; MANCHESTER: Victoria Buildings; PLYMOUTH, DEVONPORT, SWANSEA, & NEWPORT.

NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED.

33 & 34, SHOE LANE,

LONDON, E.C.,

Dec. 28, 1899.

SUNLIGHT WHITE MANTLES.

Dear Sir,

Referring to an advertisement of the Welsbach Company which has just appeared claiming that it "is doing its best to accelerate the action against our White Mantle," we beg simply to state that, having asked the permission of the Court to administer certain interrogatories to the Company and its servants - the fairness of which has, of course, to be judged by the Court before we administer them - we have been met by an announcement that the Welsbach Company's officials will refuse to answer these interrogatories, and will take this preliminary point up to the House of Lords. This is what is termed "accelerating the action."

We take this opportunity, however, to remind our customers that, with every mantle we sell, we are prepared to give the most ample guarantee to the buyer.

We would further remind the Trade generally of the great risk they are running in dealing in the Kern (new Welsbach) Burner. We have commenced actions both for the revocation of the Kern Patent, and for infringement by the Welsbach Company of our DeMare Patent, which Kern attempted to purchase "in order to protect the Kern Patent."

Should any general Reduction take place in the Prices of our Burners or Mantles, full credit will be granted on Stocks in the hands of our Agents or the Trade, if ordered subsequent to the date of this announcement.

NEW SUNLIGHT INCANDESCENT COMPANY, LTD.,

L'ce Fletcher,

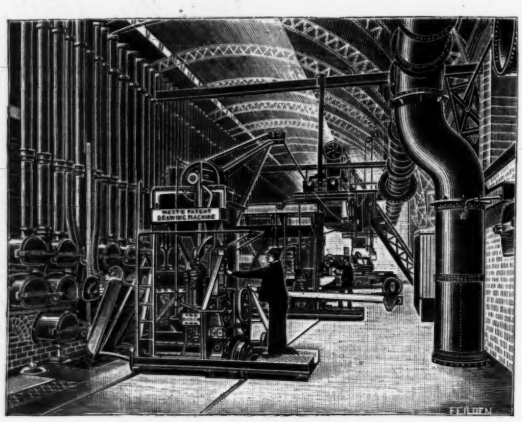
Secretary.

WEST'S GAS IMPROVEMENT CO., LTD.,

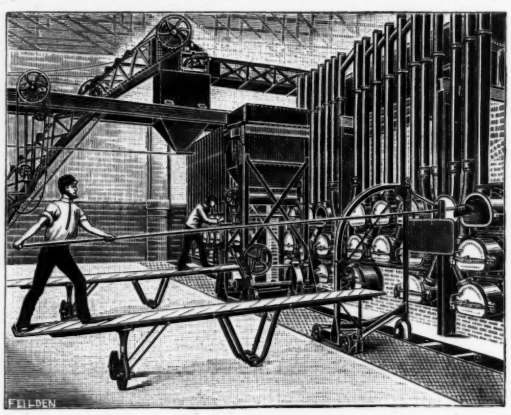
ALBION IRON-WORKS, MILES PLATTING,

And 104, QUEEN VICTORIA STREET, LONDON, E.C.

MANCHESTER.



West's Compressed Air Charging and Drawing Machinery for Gas-Retorts.



West's Manual Charging and Drawing Machinery for Gas-Retorts.

WEST'S

PATENT

Silent Coke-Conveyor.

SPECIAL FEATURES:

This Conveyor is specially adapted for Elevating and Storing Coke in the Coke Yard or Overhead Hoppers.

SILENT IN ACTION, and is easily driven; the power required for driving being very small.

Has easily renewable and inexpensive wearing parts.

Is fitted with HUNT'S PATENT ROLLER CHAIN, which is specially adapted for the conveying of gritty materials, as the Rollers prevent excessive wear of the Chain Wheels.

The working parts of the Chain and Slide-Bar are easily and efficiently lubricated by a special lubricator fixed at one point.

No Rivets or Bolts in the Chain to work loose; the whole of the Chain being kept together by the Joint Pins.

DOES NOT MAKE ANY BREEZE, as the Coke does not roll over in its passage along the Conveyor; and no violent rubbing of the pieces against one another occurs.

CONTRACTORS FOR

West's Patent Regenerator Furnaces and Settings, Mouthpieces, Retort-Bench Fittings, &c. Air-Compressors, Hauling-Capstans, and General Engineering.

THE EAGLE RANGE & GAS STOVE CO., LTD.,

(Late ARDEN HILL & CO., LTD.),

"ACME" GAS STOVE WORKS,

ASTON, BIRMINGHAM.

No. 1082.

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GOOD GAS FIRE.

THE

"ACME"

IS THE BEST.

Order Sample.

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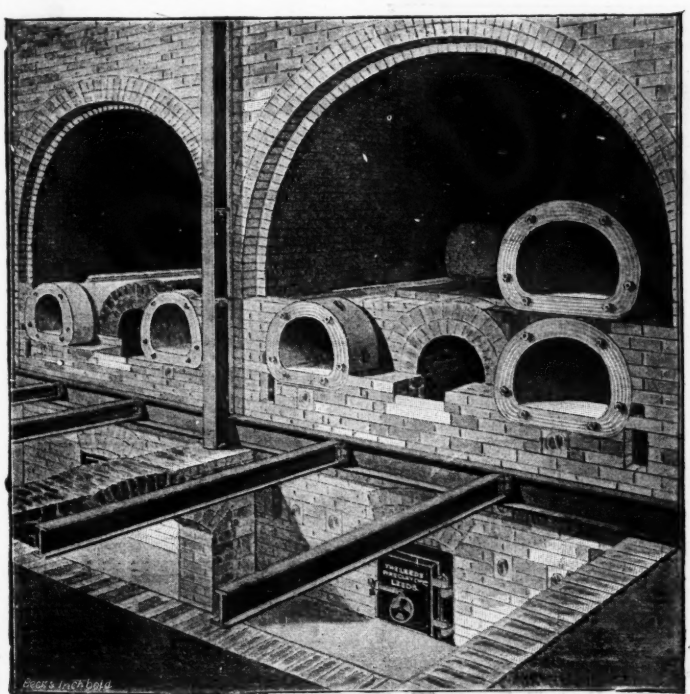
THE LEEDS FIRE-CLAY CO., LD.,

ENGINEERING DEPARTMENT

Telegrams:
"SETTINGS, LEEDS."
Telephone: No. 612.

WORTLEY, LEEDS.



Engraved from a Photograph taken during Construction of our Shallow Regenerator Settings

RETORT-SETTINGS

OF EVERY DESCRIPTION

INCLINED, HORIZONTAL,

REGENERATOR, GENERATOR,

and DIRECT FIRED.

SHALLOW REGENERATORS A SPECIALITY

MANY INSTALLATIONS.

EXCELLENT RESULTS OBTAINED.

RETORTS RE-SET.

RETORT IRONWORK.

COAL AND COKE-BREAKING AND CONVEYING MACHINERY.

BUILDINGS, ROOFS, &c.

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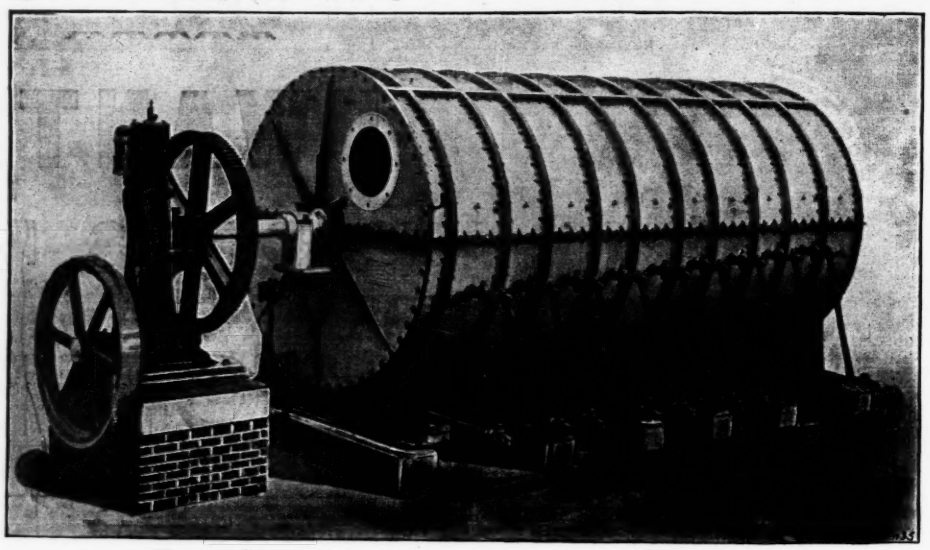
PATENT "STANDARD" WASHER-SCRUBBERS

Complete Extraction of Ammonia and large proportion of CO_2 and H_2S.

Maximum Strength Liquor produced, Minimum Water Supply and Driving Power required.



Old Pattern Machines fitted with latest Improvements at Small Cost.

PATENT "STANDARD" WASHER-SCRUBBER (one of two) recently erected at the Devon Street Works of the Birmingham Corporation.

Nearly 600 in use.

Address: 3 & 4, Palace Chambers, Bridge Street, Westminster, S.W.

Telephone No. 103. Telegraphic Address: "ELEVATOR, HASLINGDEN."

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ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

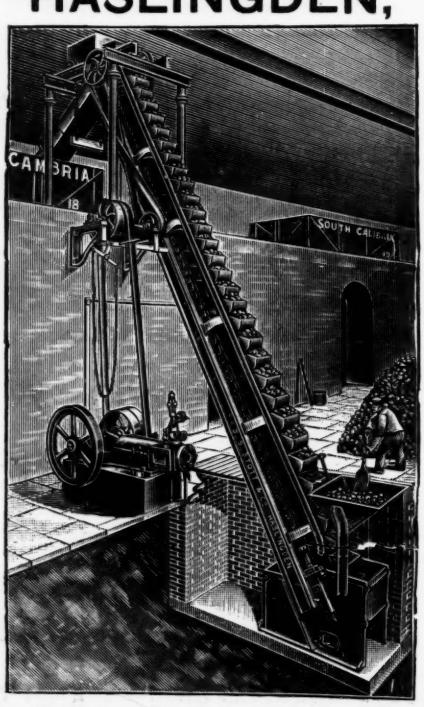
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



Coke Elevator Loading Railway Waggons.

LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS **STEAM-ENGINES** up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

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Copenhagen	700,000
Copenhagen (Second Contract)	2,500,000
Belfast	1,700,000
Belfast (Second Contract)	4,500,000
Brussels	700,000
Brussels (Second Contract)	700,000
Liverpool	3,500,000
Liverpool (Second Contract)	4,500,000
Tottenham	750,000
Tottenham (Second Contract)	750,000
Santiago de Cuba	400,000
Swansea	750,000
Manchester	3,000,000
Brighton	1,750,000
Preston	1,500,000
New York	1,200,000
Southport	750,000
Bath	1,000,000
Newburgh, N.Y.	350,000
Newburgh, N.Y. (Second Contract)	250,000
Hoylake	125,000
Coventry	600,000
Coventry (Second Contract)	600,000
Bordentown, N.J.	125,000
Winchester	200,000
Shanghai	225,000
Stockport	500,000
Norwich	1,000,000
Holyoke, Mass.	600,000
Lea Bridge	350,000
Lea Bridge (Second Contract)	350,000
Stockton-on-Tees	500,000
St. Joseph, Mo.	750,000
Edinburgh	2,000,000
Guildford	350,000
Brentford	1,200,000
Bridlington	125,000
Syracuse, N.Y.	850,000
Middlesbrough	1,250,000
Croydon	1,250,000

	Cub. Ft. Daily.
Commercial Gas Co.	850,000
Commercial (Second Contract)	850,000
Commercial (Third Contract)	1,250,000
L. & N.W. Railway, Crewe	700,000
Taunton	225,000
Lawrence, Mass.	400,000
Rotterdam	850,000
Dorking	125,000
McKeesport, Pa.	500,000
The Gaslight and Coke Co., Bromley	3,750,000
The Gaslight and Coke Co., Nine Elms	2,750,000
Durham	200,000
New York (Remodelled)	11,000,000
Scarborough	800,000
Perth, W.A.	125,000
Bremen	550,000
Maidenhead	225,000
Epsom	225,000
North Middlesex	150,000
Wandsworth and Putney	1,800,000
Aarhus	800,000
Falmouth	150,000
Southampton	800,000
Hartlepool	750,000
Utrecht	1,000,000
Deventer	150,000
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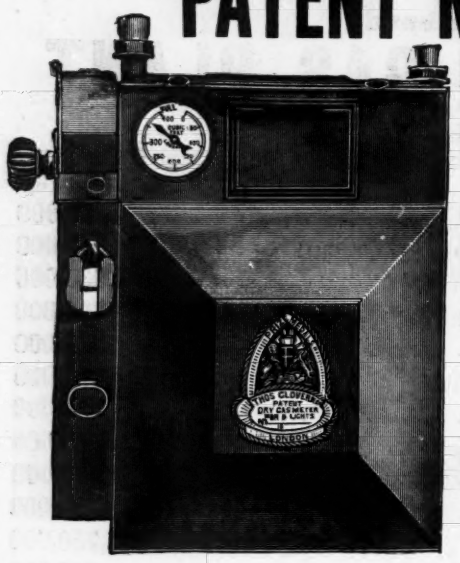

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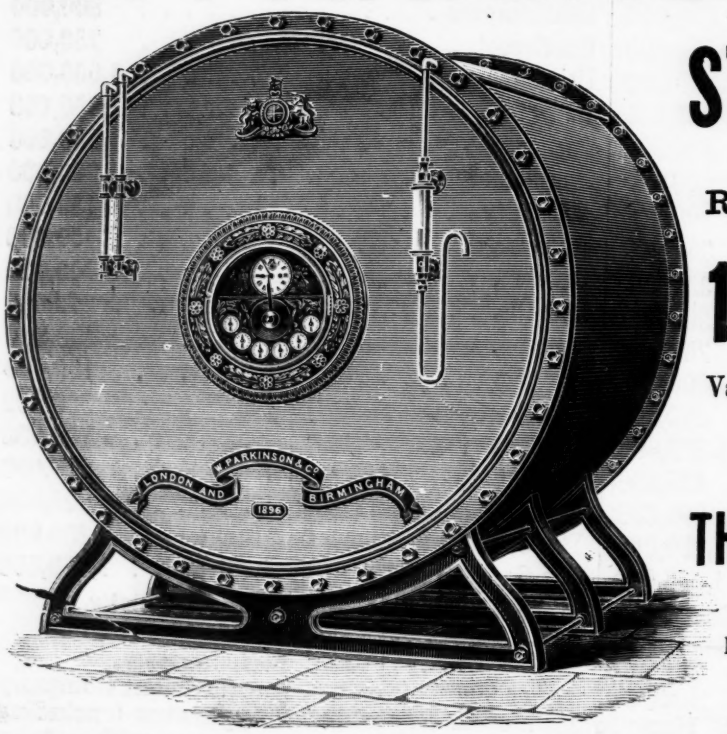

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EDITORIAL NOTES.

The Scarcity of Coal.

THE only subject many British gas managers can think about just now—or have thought of, for that matter, these many weeks past—is coal. Gas-works administration and gas management mean different things at different times. Often it is plain sailing, so that the usual director or the common—very common—councilman can lounge or bustle through his perfunctory duty in the board or committee room, according to his temperament, and feel that he is a Somebody. The officer who takes the business control, too, whether engineer, or secretary, or that comparatively scarce hybrid, a general manager, having bought his supply of coal for the year with his accustomed acumen, ordinarily troubles himself no further upon this score. The monthly deliveries come in, and the cheques go out; and there an end. Months ago, however, those wary and alert gas managers who had experience or forethought of the extreme delicacy and complexity of our coal mining, shipping, or railway transit arrangements, perceived signs which led them to think it might be just as well if the usual rate of summer delivery was increased. As the winter drew near, the contractors with one consent began to get behindhand with their consignments; and the stocks of coal at many gas-works suffered at both ends. Never was there so much gas wanted; hardly ever was coal so scarce. Ornamental directors and unpractical committeemen felt themselves "out of it." They knew nothing, nor could they do anything in the emergency. The responsible official had to quit his office, where it had been his habit to receive the coal people courteously or otherwise, as his nature was, like a despotic sovereign, and go to them and the shipping or railway folks hat in hand. It was not enough to have bought the coal, the trouble was that it did not come to hand. There has been a very sharp pinch for many a gas-works, big and little, which has felt nothing of the kind for a generation. We have heard of coal stocks which have been run down to a matter of days, where the output of gas is not on a scale that could be eked out by getting in a few cartloads of house coal from the nearest wharf. Besides, the house-coal merchants had none to spare, but were constrained to keep their own customers going by distributing single sacks of the precious fuel. In the case of London, the seaborne supply was sadly deficient; and the railway coal traffic seems to have failed miserably. Notwithstanding the opening of another coal-carrying railway into North London, which was to have worked wonders, it was impossible to get deliveries. All this goes to show that prudent gas management is not child's play, and also that an Act of Parliament is no substitute for a man with a head on his shoulders in the position of director of affairs. What the effect of the emergency purchases will be on the price of gas must shortly be declared. It is to be feared that some undertakings have been hard hit. There is no remedy but paying. Litigation in respect of broken contracts to deliver will not mend matters, for the contractors have done their best. Circumstances have been too strong for them, and for their customers also. It is at such times of stress that the personal element waxes large; and the gas manager who has never played the "jack-in-office" stands the best chance of being attended to when he has to beg instead of to command.

Naturally, the gas-works situated in closest proximity to the coalfields have suffered most from the shortage. They do not stock much, as a rule, and are not always aware in time of the nature of the prospects of the trade that surrounds them. The truth of the old saying that one must leave home to hear news of it applies in the coalfields as elsewhere. It is unhappily only too probable that the worst is not yet over; and we shall not be surprised to hear of restricted outputs of gas for some weeks yet. Still, the other Christmas traffic being over, coal is being passed along the railways again at something like the ordinary rate of despatch. That is one way of relief. Then, though the unprecedented activity of all manufacturing industries keeps coal in great demand, and colliers are certainly not getting any more coal to bank than they can help, the temptation to open more mines is irresistible, and supplies are sure to grow larger. Many pits, shut down because they did not pay at the prices of last year or the year before, are being started again; and there will be a great impetus to the

making of new ones. Several English coalfields are as yet undeveloped; and it will be time enough to talk of a "coal famine" when all that is possible has been accomplished in this direction. The indication, therefore, is that coal must fall in value, sooner or later. The passing pinch is not the coming on of the inexorable Fate predicted by Jevons, but is purely a temporary congestion. Prudent users of coal will therefore keep their heads cool, and limit their demands to the smallest margin over bare necessity. There is on the part of the public a tendency to fly to extremes amid such circumstances. No sooner do they realize that house coal has gone up 5s. a ton, than they rush to buy lest it rises another 10s., and thereby not infrequently help to bring about the effect they dread.

It is gratifying to observe that the newspaper Press of the country has, on the whole, preserved an attitude of calm restraint in dealing with this important topic of the hour, which does infinite credit to the good sense of its conductors, and will help materially to keep the public from panic. Here in London we are thankful to feel that sensation-mongers have had their day in the leading newspaper offices, and a sounder fashion of reasonable news reporting and discussion is prevailing. Whereas there used to be Editors having the ear of the public who seemed to think it smart to be always shouting "Famine" when a necessary of life became dearer, or "Plague" if the wasted water supply had to be husbanded, these hysterical gentry have been cleared out, almost to a man; and their successors are acting more like reasonable beings. Thus, the "Daily "Chronicle" has wisely gone to a leading member of the coal trade to learn all about the situation; and his last words were: "Preach no panic to the public." All will come right if there is no more push. This is sensible and helpful. If all newspapers, when topics are "burning," would only use their means of gathering information in the right way, and apply to the proper sources for it, the gain to their readers would be immense.

Questions of the London Gas Supply.

A CORRESPONDENT of a financial journal has been airing his views of Gas Company Regulation, which he calls an "argument for a general and clearly defined public policy;" and inasmuch as this is the first sound of that clamour of criticism which is certain to be evoked by the London Gas Bills of the year, it is worth at least passing notice. The anonymous writer, who styles himself "Engineer," gives some internal proofs in his letter that he has lived in the same parish with a gas-works. He is not, however, altogether sound in his data. He says, to begin with, that the Powers of Charge Committee of last session "were con-"vinced that the operation of the sliding-scale as applied "to Gas Companies had not been conducive to good man-"agement." This is a complete misrepresentation of the recommendations of the Committee on this head, as reference to the record will show. He declares that "the "initial price for the sliding-scale was fixed too high at "5s. per cent. for each penny above or below the initial "price." This is cryptic; but it is probably intended to mean that, with such a sliding-scale, the initial price was too high in some instances. The writer's opinion is that gas shareholders ought never to get more than 10 per cent. "consideration;" but this is to reject the sliding-scale altogether. On other matters of finance, the critic is worse than foggy. He thinks there is no independent audit of the London Gas Companies' accounts—never having heard of the Board of Trade; and he imagines that under the sliding-scale all capital charges are taken out of profits in excess of the dividend. There is more force in the criticism that Gas Companies who can distribute "12, 13, and "more per cent.," are not working on a commercial basis. We all agree that it would be a satisfaction to find a line of policy suitable for the regulation of all incorporated Gas Companies on such a basis; but, unhappily, there is no prescription of the kind before the public. The critic insists that there should be no derogation whatever from the 16-candle power standard of quality for London gas, as tested by the portable photometer, and safeguarded from sophistication by making 10 per cent. the maximum for carbonic oxide. He contends that "if a "lower illuminating power than 16 candles is ever intro-"duced, it would mean larger gas bills in proportion to "the units of heat absent in the lower quality of gas." The detail that the price would be proportionately less is overlooked. All this is to a certain extent interesting; and one wishes that the public would more often take pains to ventilate their notions on the subject. Part of the trouble is that London is such a heedless monster that nobody knows what to think of the things said and done in its name. London, or a conspicuous part of it, once had a cannel gas supply. This was given up without anybody feeling the worse for the loss; and it is open to be argued that, for 2d. per 1000 cubic feet off the price, London would be the gainer to take 14-candle gas instead of the present supply.

Some Statistics of Trade in 1899.

THE returns of the Board of Trade for the month of December, and the aggregate returns for the twelve months, were published last week, and form some basis for an estimate of the condition of trade in this country during the past year. It is, however, at best a very meagre and unsatisfactory basis; and our Board of Trade are by no means as enterprising or efficient as they might and should be in providing reliable and intelligible trade statistics. Unless and until statistics of production are obtained from at least the leading industries in the country, the condition of British trade can only be ascertained—or, rather, inferred—from various unofficial, and by no means always trustworthy reports. This want is especially felt in considering the state of trade in 1899; for there can be little doubt that the revival which has obviously taken place in not a few industries has been due to stimulated home consumption in a much greater degree than to the growth of foreign trade. The value of the imports for the year shows an increase of 3·1 per cent. over 1898; while the exports (excluding new ships sold to foreign owners, not estimated in 1898) were 9·9 per cent. more in value. The difficulty in regard to these figures—satisfactory, so far as they go—is to ascertain how much of the increases was due to greater volume of trade, and how much to higher prices. For instance, in December the exports of coal exceeded in value the corresponding figures for 1898 by 25·8 per cent., while showing an actual decrease in tonnage of 1·3 per cent. Iron and steel exports, on the other hand, increased by 38·5 per cent. in weight and 37·2 per cent. in money—an almost proportionate rise.

For more light upon the question of the extent to which the trade revival of 1899 was one of higher prices or one of greater volume, we turn to Mr. Augustus Sauerbeck's letter on the "Prices of Commodities" in "The Times" a few days since. He therein compares the average prices of 45 leading commodities in 1899 with his records for preceding years. His statistics show that the average of these prices last year was 6¼ per cent. higher than in 1898, and 11½ per cent. higher than in 1896 (the lowest year on record). The increase in 1899 was, says the writer, somewhat less than many observers had anticipated; but it is accounted for by an absolute decrease in the prices of food-stuffs. The most marked rises were in the two groups, minerals and textiles. The prices in the former were 30 per cent., and in the latter 43 per cent., higher than in 1898; but textiles were exceptionally low in that year, whereas minerals had already begun to advance. The inference, it would appear, is that our foreign trade has not increased very considerably in volume, but satisfactorily in value. The trade revival is chiefly an affair of home markets. We shall not, then, we think, be far wrong in saying that the main source of the revival in trade generally was the great activity in the iron and mining industries. The consequent increase in rates of wages gave the working classes greater spending power, which in large measure accounts for the prosperity of the textile trades. In short, the men have earned, and the women spent, more money; while the effect upon trade generally of prosperity in two of the staple industries of the country resembles that of casting a stone into a pond.

We have recently pointed out that the activity in the iron and steel trades has been in no small degree due to the large amount of shipbuilding that has been, and is, everywhere in progress. The returns just published by Lloyd's of the shipping launched in the United Kingdom last year certainly confirm that opinion. The total output for the year was 761 vessels of 1,585,381 tons displacement—figures which surpass all previous records. In some previous returns of this kind, we are told, the figures for 1889 have been taken for comparative purposes as a rough approximation to the maximum productive capacity of the shipbuilding yards of the United Kingdom. The fact

that the output of that year was in 1899 exceeded by 207,000 tons as regards merchant vessels, and by about 127,000 tons as regards war ships—in all an increase of over 26 per cent. as compared with 1889—"indicates "alike the remarkable character of the year's work, "and the great resources of British shipbuilders." The influence of this growth of shipbuilding on the engineering trades was further enhanced by the fact that in 1889 10 per cent. of the output consisted of sailing tonnage—requiring, of course, no propelling machinery—whereas last year all but 0·14 per cent. of the output were steam-propelled vessels. At the end of the year no less than 1,306,751 tons of shipping were in course of construction in our yards. This and the fact that Navy construction shows signs rather of general increase than of a falling off (the German Emperor appears to be on the high road to success in his plans for doubling his Navy) confirm us in the opinion that the engineering and metal industries will continue active for some time to come; and, despite the check upon many trades—particularly those providing articles verging upon or included in the category of luxuries—which will be the certain consequence of the war, we do not think that 1900 will see any considerable reaction from the activity of 1899.

Coal Miners and the Workmen's Compensation Act.

SOME persons have funny ideas as to what constitutes evidence—more especially if they are politicians, or writers on political subjects, for whom the personal element always is the paramount consideration. Over and over again, the habitual reader of newspapers will stumble upon amusing examples of this amiable weakness. Once a public man attains the rank either of a saint or a "bogey," everything he does or does not do is adjusted to his reputation. Up to a point, a statesman's reputation depends upon his sayings and doings; but beyond this point, his reputation overbears everything recorded of performances in word or deed. To many people, Mr. Chamberlain is a "bogey;" and they hate the Workmen's Compensation Act chiefly for his part in it. The "Daily News" is of this frame of mind. Last Friday, this ably-conducted newspaper had a leading article condemning the Act in unmeasured terms—the remarkable thing being that the subject was introduced in connection with the proceedings of the Cardiff conference of the Miners' Federation, which unanimously passed a resolution calling for the extension of the Act to all trades! This is odd, for an Act described as completely falsifying the predictions of its authors.

The article goes on to condemn the Act as provocative of litigation to an extreme degree. As to this, it is instructive to read the testimony of the delegates at Cardiff. The motion under discussion was for the extension of the Act to other trades and workmen, and for the abolition of the fortnight's grace, with a minimum allowance. A delegate from North Wales said they were in this region "receiving "the full benefits of the Act, and had only had to go into "Court with two cases." A man from Cumberland testified that not a single case had been taken into Court. The Chairman agreed with this witness that the Act could be worked at a cost of one-third of a penny per ton of coal raised. The Vice-President of the Welsh Federation acknowledged that there was no difficulty in the working of the Act, either from the employers or the Insurance Offices. He only had the reasonable comment to make that claims should be promptly settled. A Scotch member complained of the smallness of the scale of compensation for young people. This was all the criticism of the working of the Act. Where is the condemnation here?

If the "legal editors" of the Act—meaning those painstaking lawyers who have made books upon it—do not like it, is this good evidence of its failure? The truth is that most of the dissatisfaction with the Act and the litigation has been over boundary questions. Problems of this kind will never be got rid of. The Trade Unions might be consulted on this head. Once let it be admitted that a man is protected by the Act, and there is no room for litigation worth speaking of. Make all workpeople claimants, and this boundary difficulty would not disappear; for it would often be asked, Who is a workman? It would be no easier to decide who is a "workman," than what is a "factory" within the meaning of the present Act. Next time the "Daily News" vents its dislike of the Act, it had better provide more evidence of its failure than was shown at the Cardiff conference. This is the second time we have convicted our contemporary of entertaining prejudice against the Act, without regard to the weight of evidence. The first time it was a question of the asserted excessive cost of working the Act; and we then disproved the imputation by referring to the fact of the willingness of Insurance Companies to renew policies for a second year at largely reduced premiums. The "Daily News" must try again at a fresh place.

Gas-Works Traders' "Rings."

INFORMATION has reached us of the recrudescence, among a certain order of purveyors of gas-works necessaries, of the attempt to control prices by the formation of "rings." An exposure of a trick of this kind appears in another column. There is no need to vouch for the genuineness of this information; those implicated will recognize their own handiwork. Once more, let us say, this practice is foredoomed to failure, and cannot be defended on any legitimate ground. Ten firms may join to make a price; but they can never tell that an eleventh will not spring up to snap the job on which they have set their hearts. This is a free country. All gas-works supplies are open to the market. If certain firms lay themselves out for doing the gas-works trade, they ought to be able to quote the very lowest prices. They can combine to keep their prices unnaturally high only at their peril. There are scores of manufacturers and dealers in commodities similar to those required in the gas industry, always ready to "chip in" if they only get wind of any jobbery in the gas connection. The only sure way of keeping a trade in a speciality is to do it better and cheaper than any outsider can hope to effect. Of course, the question of rings as against list prices is one of degree. There is no objection whatever to dealers in standard articles agreeing not to cut one another's throats by offering one commodity and then another at an unfair discount. Poaching is not sportsmanlike. On the other hand, the sportsman must act on the square, and not be greedy. It is to be hoped that the British Parliament will never be troubled with the demand for legislation on the lines of the American Anti-Trust Laws. Quite recently, most American makers of gas and water pipes formed themselves into a "Trust" and divided the land. There were six of them; and the "combine" has been declared illegal by the Supreme Court. Whether legal or not, we do not want anything of the kind here.

Unlovely Aspects of Trade Unionism.

PRACTICAL Trade Unionism has not added to its reputation of late. The most successful organization of the kind—the Miners' Federation—has been holding a conference at Cardiff, apparently to advertise the fact of the Federation having at last gained a footing in South Wales. Mr. Ben Pickard, M.P., presided over this gathering; and it is now to be supposed that "Mabon" and all the other Ancient Britons will have to take a back-seat at these celebrations of the glories of Trade Unionism. This is one of the penalties the Welshmen pay for the follies of 1898. Mr. Pickard pronounces against sliding-scales for the regulation of miners' wages. He graciously approves of the Welsh Conciliation Board, without the independent chairman once regarded by the colliers as indispensable; but he warns the men that they must keep up their local Unions, as a protection for the workers in every pit. Mr. Pickard is still committed to the academic cause of the Eight-Hour Day; and as this nostrum bears no concrete relation whatever to the working conditions of any coalfield in operation at the present time, he thinks it just the right thing for Parliament to enact. So much for the practicality of the practical man. Even the "Daily News," while thinking that, if the leaders of the Colliers' Unions do not like the sliding-scale, this means of regulating wages will have to be dropped, demurs to the assumption of the same individuals speaking with authority on the Eight-Hour question. Why this discrimination?

Leaving South Wales, it should be noticed that this present hour of national strain and stress has been selected by the Seamen's and Firemen's Union as an opportunity for renewing the late abortive attempt to prevent the sailing of ships from British ports. The Society tailors employed by a firm of military outfitters struck at what they thought would be a favourable moment for the enforcement of their claims, and were incontinently cleared out. It is reported that the adaptation of transports for the reception of the cavalry and artillery reinforcements so badly needed at the Cape, was in several instances delayed

by "labour troubles." Lastly, the Operative Bricklayers' Society have exhibited the fruition of bad counsels by turning upon their own representative in the London County Council—Alderman R. H. Taylor—and stopping his pay because he dared to decide temporarily a demarcation dispute in a sense not desired by his own Union. This is how all the fine-spun theories about Trade Unionism "pan out." Mr. W. C. Steadman, M.P., is also by way of experiencing the ingratitude of the "organized" workman. Like Mr. Taylor, the member for Stepney has an untarnished record as a Trade Unionist and public man. If the labourer is worthy of his hire, the Trade Union Member of Parliament or County Councillor is deserving of his salary. But the sense of common fairness and honesty of dealing between man and man has been so dulled by official Society dealings with the every-day questions of work and wages, that it does not respond to the appeal of domestic duty. The cases of Alderman Taylor and Mr. Steadman are not agreeable to contemplate.

WATER AND SANITARY AFFAIRS.

THE first note of opposition to the Welsh Water Bill of the London County Council was sounded in the Private Bill Office of the House of Commons last Tuesday, when the announcement was made that a memorial had been deposited complaining that the Standing Orders of the House had not been complied with. The memorialist was a Mr. John Griffiths, the proprietor of a pump-room and hotel in a Breconshire parish possessing a name much less well known than that of this particular resident; and the nature of his allegations will be revealed when the matter comes before the Examiner on the 18th inst. Supposing he should be successful in sustaining them, we much doubt whether the Standing Orders Committee will allow the non-compliance of the promoters in this one case to jeopardize their Bill, assuming that its *raison d'être* can be justified. It is not, we think, the memorial of a Breconshire hotel-keeper that will bar the progress of the Bill, but something far more important. There was a rumour in Westminster last Tuesday that the long-awaited report of the Royal Commission had been issued, and that it was dead against the Welsh scheme; the existing sources of supply being considered sufficient for the next forty years. Nothing, however, had then been seen of the report at Her Majesty's Printers; nor has it since made its appearance. But a pretty general idea has been formed in certain quarters as to the nature of the Commissioners' recommendations. In the absence of the report, we must speak with all reserve; but we believe we are right in saying that the Commission advise that the water undertakings should be acquired and handed over to a specially constituted Water Board, composed of representatives of the Local Authorities within the existing limits of supply, with a Chairman and Vice-Chairman chosen by the Local Government Board. This, according to rumour, is the principal recommendation in the report; and it answers in a very straightforward manner the first question put to the Commission. But whether, in the existing condition of the political atmosphere, it is likely to be adopted and carried into effect by the present Government, we need not stay to inquire. It may possibly be deemed advisable to get rid of the complications brought about by the situation in South Africa before again taking up the water question; and considering the time which has elapsed since the Commission was appointed, a year or two will not make much difference. In the meantime, the water supply of London has been rendered more efficient by the intercommunication scheme; the works of the Staines Reservoirs Joint Committee are making rapid progress; and the Water Companies will shortly bring before Parliament a comprehensive project for providing for the future needs of the consumers. Whether the undertakings remain in the Companies' hands or are transferred to a public body specially created for their control, their efficiency must be maintained.

While we are waiting for the report and the opening of the parliamentary campaign, it may not be unprofitable to leave for awhile the discussion of the merits of projects for furnishing additional supplies of water, in order to consider how it will be possible to conserve and use more economically those already possessed. During the prevalence of the drought last summer, consumers of water, not only in the Metropolis, but in several Provincial towns where the supply is in the hands of the Local Authorities, had to be cautioned, by official notices and through the medium of the Press, against its misuse and waste. In this as in other matters relating to water supply "The "Times" did good service in pressing home the question of the necessity for checking waste, by presenting some interesting statistics and particulars showing how that waste arises, and how a great deal of it may be prevented by adopting suitable methods. The writer in our contemporary computed that at least 50 million gallons of water are wasted daily in London—*i.e.*, allowed to run away without doing good to anybody. In other words, twice as much water is lost in the Metropolis as would suffice for the supply of Birmingham; and, if conserved for a period of three months, it would be equal to an entire month's supply. He went on to show how, by the use of meters and by the proper inspection of premises, this great waste might be reduced without withdrawing a drop of water from any legitimate purpose, public or private, not excepting the watering of plants, the denial of which to the "poor East-ender" gave rise to so much pathetic writing in certain of the papers last year. His conclusion was that preventible waste takes place, from sheer carelessness, to the extent of about 10 gallons per head per day in London. Of course, defective closet fittings and taps left open are regular causes of waste. This was amply shown in the correspondence which took place in our columns during the autumn of last year. If this sort of thing continues, the suppliers of water—whether Companies or Local Authorities—will be compelled to take steps to have the offenders punished by the imposition of heavy fines, or to supply them only through meters. In such a matter as this, as the writer in "The Times" has pointed out, neither sentiment nor policy should be allowed to stand in the way of the public interest.

It is not, however, in these islands alone that the question of checking waste is demanding attention. In far-distant India, as we learn from a local paper recently received, the Municipal Authorities of Bombay have been greatly exercised on this and other matters connected with water supply. The services of Mr. Santo Crimp have been called in, and he has lately presented to the Corporation a report in which he discusses in a clear and lucid manner the points submitted to him—one being an augmentation of the available sources of water by the sinking of artesian wells. It appears that any development of the water supply of the city in the future will have to be effected by utilizing to the fullest extent the Tansa scheme, which Mr. Santo Crimp considers reflects the greatest credit on all concerned in it. It is not, however, with this portion of his report that we are now specially concerned, but with that in which he deals with the waste of water that goes on in the city. It is difficult for residents in climates such as ours to gauge the absolute requirements, in the matter of water supply, of residents in Indian cities; and therefore when we learn that 35 gallons per head per day are used in Bombay, we are not greatly surprised. The high temperature causes free use of water. At the same time, there are six cities —Poona heading them—whose populations seem to get on very well with 18 gallons; while the dwellers in Nagpore have to be satisfied with 7½ gallons. Allowing for any extra quantity required by the different conditions of life in the island city, there is a wide margin between 18 and 35 gallons; and Mr. Santo Crimp gives the reason for it. As a matter of fact, no less than 15 million gallons of water —equivalent to the entire supply from two of the sources— are wasted every day; and his frequent inspections of the city lead him to believe that "nearly all this is due to "leaky taps and services, and to the habit many people "have of leaving the taps open." He is of opinion that 20 gallons per head should be sufficient for the wants of Bombay. Therefore, it behoves the Water Department of the Corporation to set about reducing the consumption to the figure mentioned.

But how is this to be done? Water engineers in this country and in America will probably suggest the adoption of meters and a system of vigilant inspection. This might do very well for us and for our cousins across the Atlantic; but Mr. Santo Crimp says that it would not do in Bombay. He considers that the introduction of meters in the city would not be a popular measure; and therefore he advises the alternative remedy of repairing the defective pipes and fixing new taps. As the Corporation are said

to have an "insuperable repugnance" to the use of meters, they will doubtless favour the adoption of this remedy. Curiously enough, the late Water Engineer, Mr. S. Tomlinson, at one time advocated it; and, at his suggestion, a Water Waste Prevention Department was constituted as a part of the Municipal Administration. However, he soon discovered that they failed to stop the waste; and then he pinned his faith to water-meters. It appears from a letter in "The Times of India" (to which source we are indebted for the foregoing particulars) that up to now two forces have been in action to prevent their general adoption in Bombay. Owners of houses, the writer says, have reason to fear, from their previous experience, that meters would largely increase the cost of water, that their action would be capricious and uncertain, and that their frequent examination and repair would cause endless worry and inconvenience. They have therefore expressed a pretty firm determination not to permit their introduction. Furthermore, the Municipal Executive have been afraid that the general adoption of meters might have a disastrous effect upon the revenue; and they have taken into account the not inconsiderable expense of the staff employed in recording the registrations. He thinks the direct result of the introduction of meters would be to make it to the interest of houseowners to use as little water as possible, and to pay for the inventive faculty of plumbers in the use of water-saving appliances. Under existing conditions, it is certainly not to the consumers' interest to be economical with water. This is plainly observable both in and out of the houses, and especially at the public drinking fountains. To the leaky taps and the general dampness resulting from waste is attributed the low state of health of the poorer classes and the persistent prevalence of the plague. Unfortunately, they and the tenants of houses do not generally appreciate this. They only understand the necessity of using vessels for economizing water when, in the outlying districts, they have to lift it from wells.

It will be clearly seen, from what has been said, that the present system of open taps must be abolished; but, as far as we have been able to gather from the information to hand, no really practical remedy for the existing evils has been devised. This is the view of our Indian contemporary. It is thought locally that, admirable as are the main suggestions embodied in Mr. Santo Crimp's report on the water supply of the city generally, on this question of checking waste he has to a certain extent been led astray by lack of close acquaintance with the habits of the native population. "Constant pressure, better taps and services, "and a more efficient supervising staff, will never," our contemporary declares, "stop a waste which is caused by the "grossest laziness and carelessness, and which goes on in "every quarter of the native town." This being his view, we scarcely understand an opinion he expresses elsewhere that much good might be done by closer supervision by the Water Department of the Corporation—not in the way of summonses and cutting off the supply, but by "more "sympathetic dealing with the people at large, and by "the increased use of the gentle art of persuasion." We are greatly afraid that if water consumers are determined to be wasteful, they will not be "persuaded" to be otherwise though one went to them from the Corporation. It seems to us that they must be absolutely prevented, for the general welfare of the public, from indulging in their propensity.

The Index to Vol. LXXIV. of the "Journal," July to December, 1899, is now ready; and a copy will be forwarded (free) by the Publisher, on receipt of a post-card from any Subscriber.

Wide Tendering.—A correspondent sends us the following particulars in regard to some tenders recently submitted for fire-clay goods. The offers were sent in by five Stourbridge firms and a Yorkshire firm, and were based upon a detailed specification. All the goods were priced out. One Stourbridge tender was for £2441 0s. 10d.; the other four were each for £3002 2s. 6d.; and the Yorkshire firm's figure was £3315 8s. 3d. The order was placed with the parties who sent in the lowest tender—a first-rate firm of old standing. The reflection that naturally arises on looking at the figures is: If this firm can supply, at a fair profit, for £2441 the goods required, as no doubt they can, what must be thought about the extra £561 charged by the other firms in the same locality who submitted tenders? The fact that the tenders of the latter firms were all alike to a penny speaks for itself.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 160.)

BUSINESS last week on the Stock Exchange was extremely quiet from start to finish. At the opening, things felt dull at not receiving better news from the seat of war; but before the day closed, they brightened up a bit. Then came a long period of equilibrium, with hardly any movement, but with a good steady tendency. The favourable disposition was confirmed when it was seen that the fortnightly settlement was going through smoothly; and the progressive cheapening of money had a powerful influence. Thus, although business was small and subdued, prices all round had a nice advance; and Consols at the close were only just short of touching par. The chief source of this favourable tendency was in the Money Market, which moved by rapid strides from easy to easier. The reduction of the Bank rate from 6 per cent. (fixed on the 30th of November) to 5 per cent. became inevitable on Thursday—a reduction which was happily accentuated by similar movements in the Banks of France and Germany. In the Gas Market, business was decidedly quieter, and altogether in sympathy with the tone of the other departments in general; and, as in the preceding week, transactions were to a great extent confined to the big issues. Variations of quotation were very few and slight; and though there were as many in one direction as the other way, the prevailing tendency was more settled in favour of firmness. Gaslight issues had by far the greater share of all the business done, and were steady. The ordinary was not too strong at the opening, and marked 104; but it got better as time went on, and closed with 105½. The secured issues were fairly active; but they gave no sign of a move either way. South Metropolitan was rather jumpy at first, but soon settled down to good steady figures. Commercials were hardly touched. The Suburban and Provincial Companies were about as near to actual stagnation as they were in the preceding week; and the only change was a slight reduction in Alliance and Dublin. The Continental group were not active beyond a moderate amount in Imperial, which receded a couple of points. The remoter undertakings were little dealt in, and made no sign. Business in Water was at about its usual level. Prices were irregular—Chelsea improving, while New River and West Middlesex went back.

The daily operations were: Business was moderate on Monday, mostly in Gaslights and South Metropolitan. Imperial fell 1, and Alliance and Dublin ¼. Transactions were lighter on Tuesday, and Gas quotations did not move. In Water, West Middlesex dropped 2. Business was much restricted on Wednesday, and prices were easy. Imperial receded 1 more. In Water, Chelsea advanced 2; but New River was 3 lower. On Thursday, Friday, and Saturday transactions continued very moderate. No further changes occurred in quotations; and prices in general ruled pretty firm.

ELECTRIC LIGHTING MEMORANDA.

Electricians' Worries—Indiarubber and Copper—The Fuel Value of Towns' Refuse—Electric Light in Whitechapel.

THE electrical industries are getting very uneasy on several independent accounts. First and foremost, like everybody else, they are at their wits' end for coal. True, they try to console themselves with the fond belief that the shortage of coal must hit the gas industry even harder than their own. But that reflection is open to several qualifying considerations; and meanwhile it does not help to make the wheels go round. The deficient quantity and exorbitant price of the best Welsh steam coal, which alone is suitable for the central stations of the most important electricity supply undertakings, is a terrible affliction in many ways. The very best of fuel is not too good for the needs of these establishments, cramped as they are for boiler house room and power. Besides, there is the policeman over the way or round the corner, with his eye on the top of the chimney; and penalties for creating a smoke nuisance are cumulative. Coke is out of the question. There is none of the oven variety to be had; and gas coke is not the drug it was. Liquid fuel? Unfortunately, mineral oils threaten to grow scarcer and dearer. Experience proves that what is called cheap liquid fuel does not long preserve this character. Buyers are pressed to take it at an "alarming sacrifice" when it suits the sellers' book to unload an embarrassing stock. But this operation once effected, up goes the price for future supplies; and the liquid fuel user pulls out his injectors in disgust.

The shortage of coal may be, and probably is, temporary. There is no real dearth of it in sight; although prices will be unsettled for some time to come. Electricity supply, however, is dependent on other necessaries besides cheap coal. Indiarubber and copper are also becoming "words of fear" to the electrician, who has never really loved the cable manufacturer. The electric light engineer has frequently spoken his mind respecting the indispensable cable men, and cannot forgive the latter for playing the part of the "still swine that eats up the draff." Cable makers do not read papers, nor trouble themselves about load-diagrams and differential methods of charging. All

they do is to fill orders, preferably for cash, and distribute comfortable profits. Nor are they greatly disturbed by the multiplication of discoveries that the early electric lighting insulated cables are not lasting so long as was once expected. Copper? Well; copper is a mystery. The imagination of electricians has always played round this necessary of their trade; and more than one bold schemer has suggested the sinking of something analogous to another National Debt in copper mains. For years past, rough copper was worth about £50 a ton; and the producers were not very prosperous. Some remarkable aspects of the copper trade have been discussed by Mr. R. G. Elwes in the "Financial News." The impressive fact is brought out that the commercial introduction of electric lighting in or about 1880 doubled the demand for copper for the decade. Ever since, the output has steadily increased, and is likely to keep up. Moreover, it is worth bearing in mind that, whereas the older uses of the metal (as for locomotive fire-boxes, the sheathing of ships, and utensils of different kinds) only amounted, as it were, to a lending of the material for the purpose—most of it coming into the market again later in the form of scrap—the electrical employment of copper absorbs it once for all. Mr. Elwes holds the opinion that for years to come, in the most favourable conditions, the value of copper is likely to rule just high enough to make it sensibly dear—say up to £75 per ton—without actually checking the demand. Meanwhile, it should be observed that mechanicians are dispensing with copper wherever possible, thereby abandoning it to the electricians.

A very serviceable and timely communication on the subject of the fuel value of towns' refuse has been made to the "Electrical Review" by Mr. Ed. C. De Segundo. The attention of members of local authorities should be directed to this statement, because it is more than likely that the dearness and scarcity of coal may be worked to the advantage of schemers of dust destruction-*cum*-electricity generation plants. It seems tedious to be always going over this ground again and again; but experience teaches that the ignorance of some local authorities in respect to such practical matters is almost invincible. Yet so long ago as 1888 the Local Government Board instructed Colonel Thomas Codrington to make a report upon the whole subject of the burning of towns' refuse with utilization of the heat evolved; and the result was to show that this heat cannot be rightly regarded otherwise than as a bye-product of extremely variable amount—the working in one locality being no guide to what may be achieved in another. Mr. De Segundo criticises recent papers and reports setting forth the value of refuse destructors, pointing out that the data do not agree with Colonel Codrington's figures. The character of the refuse, judged as fuel, varies enormously, not only from time to time, season to season, but from load to load. The proportion of moisture is always uncertain. The general conclusion is that the heat of refuse burning is purely adventitious. The first duty of the apparatus is to efficiently consume or cremate the offensive stuff it has to deal with in an innocuous manner. What to do with the heat evolved is a secondary consideration. And it must be so; for there are times when the refuse will not burn itself at all, and the accident of its being a better or worse combustible has nothing to do with the needs of any heat-utilizing plant attached to it. If the heat evolved abundantly at the periods of the best working could be saved or stored up for equalizing the output, there would be something more to say about it; but this cannot be done. From the point of view of the ratepayer, therefore—which should also be, but is not always, the standpoint of the local authority—the dust destructor remains merely one means among others for disposing of town refuse, and must be valued accordingly. The disposable heat is no asset.

One of the latest examples of the combination just discussed is the Whitechapel Vestry plant; the central station being situated next door to the destructor yard, "in the very heart of the district." There cannot be many localities of which this can be said. It does not sound very nice, even for Whitechapel; but perhaps it will save the Vestry something in cables. Another peculiarity of the undertaking is the system of charging for current supplied to private consumers, who will pay a penny per unit for all the current taken during the six summer months, and during the winter season according to one of two optional scales. The first scale provides for the continued charge of a penny per unit, with the addition of 1s. per month per lamp used. The second scale is based on charging 8d. per unit for the current taken during the first sixty hours per month, and 1d. per unit for the rest. The Vestry informs the public that ordinary shop and house lighting on these terms will work out at 2½d. per unit, "which is so much below the cost of gas that the District Board are assuring ratepayers that the saving by using electricity will repay the outlay on fittings in less than three years." The wonder is if this statement will go down in Whitechapel, where, if the people have money to spare for luxuries, electric lighting is not likely to be included in the category.

Water-Meters and the Prevention of Waste.—At the meeting of the Institution of Mechanical Engineers on the 26th inst., Mr. W. Schönheyder will read a paper on "Water-Meters of the Present Day, with special reference to Small Flows and Waste in Dribbles." The author will indicate the features of the various kinds of water-meters, and describe in detail the "Imperial" meter, one of which will be shown in operation.

A HISTORY OF GAS PRICES IN LONDON.*

THERE is no more engrossing study for professional economists as well as ordinary people than the prices of commodities, and how they have altered from time to time. In particular, the determination of the market value of a totally new article is always a curious question. It is easy to understand how the merchants who introduce a novel commodity, or a product, to compete on something like common ground with another article of the same kind already in the market, are fain to attract purchasers by selling it a little cheaper, or else manifestly offering better value for the money, than the old stuff. But when it was a case of supplying the market with something absolutely new, as illuminating gas, and delivering it to the consumers' own door, in a fashion that had never before been thought of, it can readily be understood that the price to be charged could not be arrived at by any such simple process. We are so accustomed nowadays to the principle of house-to-house distribution of necessaries, that it is hardly possible for us to realize the force with which the compulsory adoption of the principle as an essential feature of the new industry of gas manufacture and supply must have struck our forefathers in the years before Waterloo. It was probably this obligation to solve the problem of distribution as well as to work out the system of manufacture, that made the way of the pioneer gas companies so arduous. For this reason, the original contracts entered into between the companies and their daring customers were based on mere guesses at what was a reasonable charge. From the start, gaslight was so vastly superior to the whale-oil or colza lamps or the tallow candles of the period, that there was a good market for it; hampered only by a not unreasonable fear of the strange and subtle gas. The companies and their customers made special bargains, on the principle of renting the light, not buying the gas. Mr. Rostron, who has performed the timely service of placing upon record the historical facts of the Metropolitan gas industry, has omitted to mention this, the earliest phase of the question of price. It is not, perhaps, very material to the actual issue now awaiting the attention of Parliament; but it is well that gas-works administrators, at least, should not forget that at first, and for a long period (covering the lifetime of the original pioneers of the industry), the business was the provision of light—nothing more nor less. If this condition of the gas makers' trade had persisted, we should now be witnessing a very different state of things from that existing in gas-lit towns. The development of gas-burners would be in the hands, and to the advantage, of the suppliers instead of the consumers of gas. The only trace of this state of the industry that remains to us is the preservation of the term "rental" to signify the totality of the sales of gas by measurement and contract.

Science, however, is measurement; and no manufacturing industry can be regarded as placed upon a sound and safe basis until it is brought under rule and measure. When the London Gas Companies ceased letting out gaslight upon a rental charge, and took to selling gas instead, they very soon found themselves subjected to parliamentary enactments designed to bring order into their finances, and to protect the public against being unfairly exploited by what it was realized would become a powerful and lasting "interest." At this critical juncture, as we have had previous occasion to show, Parliament was inspired with the wise determination to regulate the price of gas indirectly by formulating the maximum rate of dividend and the amount of other permissible capital charges at the command of the proprietors, instead of undertaking to say at what price it should be sold in every particular instance. Unfortunately, the intention of Parliament was in many cases frustrated. It was the time of competition in gas supply; and the safeguards of the Gas-Works Clauses Act, 1847, were looked upon as too remote from the immediate solicitude of the consumer for gas at something like his own notion of a fair price. The temptation to new gas companies was therefore to "give it a name." Thus, the Great Central Gas Consumers' Company owed their existence to the offer to be bound down to supply gas at never more than 4s. per 1000 cubic feet. This was in 1850; and the circumstance of the then existing Companies, although they had for years been under the conditions imposed by the Act of 1847, standing out for 6s. per 1000 cubic feet must be scored against the practical efficacy of this statute.

It began to appear within a few years of the admission of the Great Central Company—the symbol of competition in gas supply based on the best technical and commercial working—to the circle of Metropolitan Gas Companies, that the virtue of competition was exhausted. At the competition-made figure of 4s. per 1000 cubic feet, the industry seemed to have reached a deadlock. The Companies could hardly pay their way; and "the hole in the bucket" was discovered to be the undue diffusion of the distributing plant, its unnecessary multiplication, and its poor quality. Voluntary districting arrangements followed; and the financial circumstances of the Companies began forthwith to mend. Unfortunately, the public did not participate in this

* "The 'Powers of Charge' of Metropolitan Gas Companies. A History of the Question of Price in London from the Introduction of Gas Lighting to the Present Time." By Laurence W. S. Rostron, M.A., B.C.L., Barrister-at-Law. With a Preface by George Livesey, M.Inst.C.E. London: Walter King; 1900.

benefit. Some of the Companies who had thus escaped the pressure of competition put up their price; and this proceeding naturally caused more public agitation. The outcome was the famous Metropolis Gas Bill of 1860, which Mr. Rostron intelligently discusses. The Act when passed was declared to operate more in favour of the Companies than of the public; and it was reputed a failure because it did not punish extravagance and bad management. And so the agitation for better external regulation went on. The public had had enough of competition, which saddled London with thirteen Companies, most with excessive capital burdens; while the desideratum of good business management was certainly not forthcoming as a redeeming feature of the competitive *régime*. Utter chance seemed alone to determine whether a part of London should be decently served with gas or not. A few of the Companies had kept their capital low, and were blessed with capable administrators; and in their districts gas was comparatively cheap and generally satisfactorily. Two of these Companies, or the policies which dominated their small originals, have survived; the others have become absorbed. The new policy of amalgamation, designed to economize the cost of administering the supply by thirteen Companies, has not completely resulted in preserving the fittest.

The rest of the tale is a narrative of successive attempts to realize the original intention of the Legislature, as defined in the report of Lord Cardwell's Committee in 1867. Mr. Rostron is careful to let the parliamentary record speak for itself; and a painful story it is. Originally, the payment of a 10 per cent. dividend on the pioneers' capital was permitted; but for many years it was an ideal that seemed unattainable. No sooner was it secured, by stopping the waste of competition, than it was erected into a right. This made it difficult to link the attainment of the maximum dividend to the observance of "due care and management" of the business. A high degree of security for the maximum dividend proved to be antagonistic to the rule of leaving bad management to the natural punishment of bankruptcy. Then the sliding scale was proposed; and while one party accepted it as almost a counsel of despair, others rejected it, and yet another took to it as a panacea for the gas troubles of the Metropolis. One of Mr. Rostron's best chapters is that in which he reproduces the arguments that prevailed with Mr. W. E. Forster's Committee in 1875, and presumably weighed with the Commercial and Ratcliff Companies, who were the first to accept the recommendation of the Committee.

Here we judge it best to leave Mr. Rostron's book. He ventures to criticize the sliding scales of the London Companies by their results, as to which it is fairer to direct inquirers to the text. The circumstance of the author being a son of one of the South Metropolitan Directors, and having had the advantage of Mr. Livesey's assistance in reading his manuscript, lends authority to his statement of the subject. The book is provided with an index; and is distinctly one to be procured and studied by everybody who may be interested in the subject.

RECENT PUBLICATIONS.

The Prevention of Factory Accidents. By John Calder. (Longmans, Green, and Co.)

In this work the author, who has had an engineering experience of seventeen years, and was until recently one of H.M. Inspectors of Factories, has set himself to supply the need of a handbook dealing with the practical aspects of industrial accident prevention. In view of the very considerable liability now imposed upon employers in respect of accidents to their workmen, and of the various obligations laid upon them by the law to provide appliances calculated to reduce the risk of accidents, Mr. Calder's book will be welcomed by all users of mechanical power. The wonder is that the gathering together of the law on the subject, coupled with practical suggestions for the minimizing of accident risks, has not been done before. It has certainly been very well done now.

In the early part of the work an account is given of the number of persons employed in the various factory industries of the country, and of the accidents occurring in each of the employments. This is followed by a digest of legislation dealing with accidents to, and safety of, employees; while at the end of the book the actual text of those portions of the Factory Acts which relate thereto is given, and the various clauses are collected from their respective statutes and arranged in an intelligible manner together. The laws governing workmen's compensation for injuries are also summarized, and explained at some length. Mr. Calder gives his opinion of the Workmen's Compensation Act, based on the first year's operation. He declares himself very favourably impressed with its provisions and working, and takes the common-sense view of the litigation that has arisen from its administration:

> Notwithstanding the numerous adverse opinions expressed during the last two years as to the probable value of the measure, the benefits in relief from actions at law, and pecuniarily, which it has conferred on three and three-quarter millions of operatives in ordinary factories, and also upon half as many workers in mines, quarries, docks, railways, and other places, are very real and extensive. They have, however, been largely overlooked, owing to the remarkable facility with which the great majority of claims have been settled extra-judicially, and the very general abstention from recording such agreements in the County Courts. . . . These results [the small number of judicial arbitrations, compared with the total number of accidents, the absence of friction in the application of the Act, and the prompt settlement of claims by employers and insurance undertakers] are in striking contrast to the costly legal proceedings . . . which are annually instituted at Common Law and the Employers Liability Act, 1880, throughout the Kingdom, in connection with factory accidents, and many of which are unsuccessful.

Such testimony, from a practical man with personal experience of the working of the respective Acts, is very gratifying to those who wish well to the legislation of 1897. The main part of the book is occupied with an examination into the causes of accidents, followed by a most useful account, fully and clearly illustrated, of the most approved and successful appliances for the safeguarding of engines and machinery generally, and of dangerous machines in particular. The whole constitutes a useful, as well as an interesting and well-written, handbook.

Digest of Cases under the Workmen's Compensation Act. By James Weir, M.A. ("Insurance Observer.")

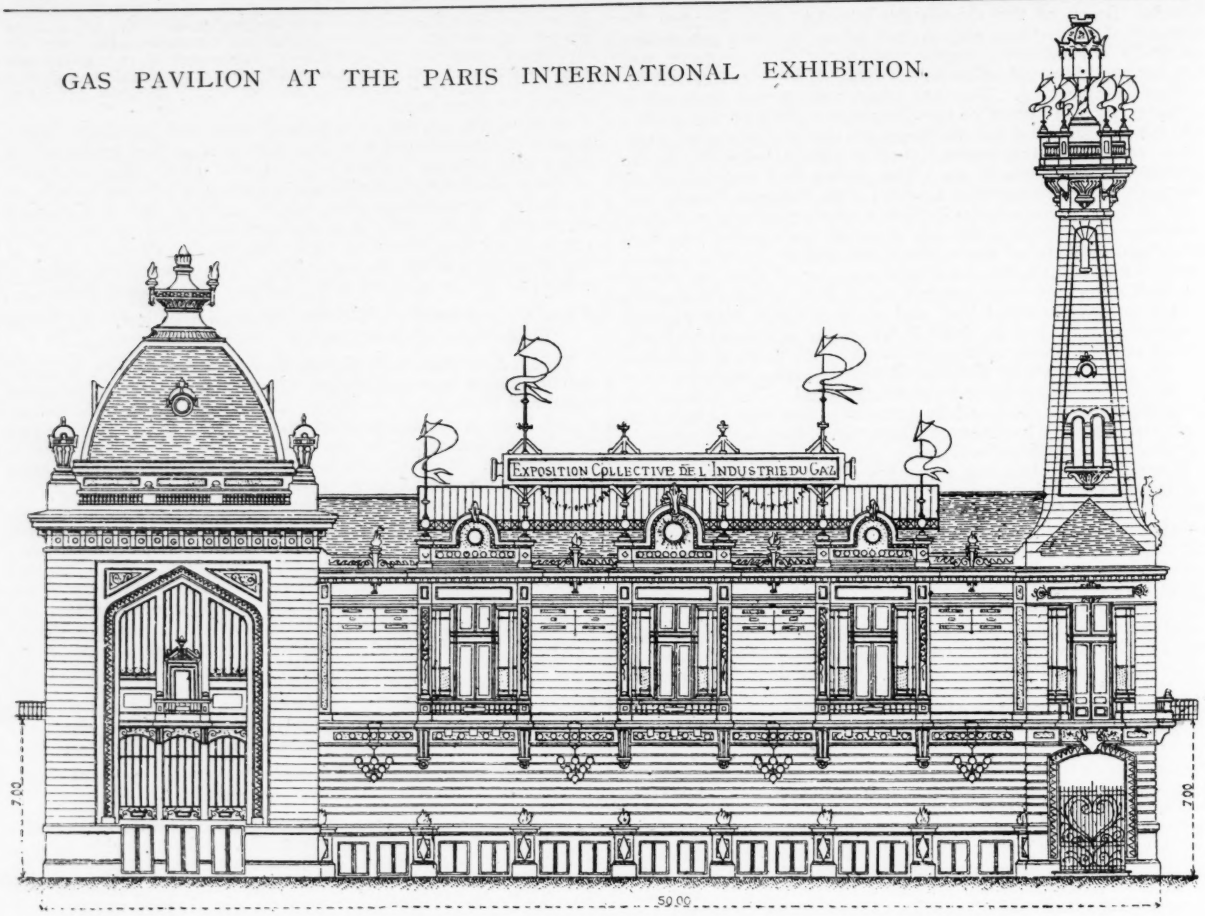
This is a reprint, with alterations and additions, of a series of articles which appeared in the "Insurance Observer" between April and September this year. The author starts with the text of the Workmen's Compensation Act, 1897, and the Factory and Workshop Act, 1895, and then gives a digest of the cases which have arisen. He states in his preface that his object has been to present "a short view of the actual results of a year's litigation" under an Act which has given rise to probably more contention in the Courts than any one which has been placed upon the Statute Book. This statement is borne out by the 56 cases tabulated, all of which went to the Court of Appeal. The first group of cases relate to employments to which the Act applies, and turn upon the troublesome words "on or in or about;" the next, upon accidents coming within the Act. Then we come to a number of cases under sub-section 2 of section 1, where compensation to a workman is disallowed if the injury can be proved to be attributable to his "serious and wilful misconduct." The fourth group of cases deal with workmen and their dependents; and the fifth, with the scale and conditions of compensation. The final group relates to procedure and kindred matters.

Water-Works for Small Cities and Towns. By John Goodell. ("The Engineering Record," New York.)

Notwithstanding all that has been written on water-works construction and water supply generally, sufficient evidence was afforded to the proprietors of the above-named publication—by letters addressed to the Editor—that further information was needed, to justify them in requesting Mr. Goodell to prepare a book on the subject, to form one of their "series." This he has done; and the outcome is the work now under notice. At the very outset he explains that it does not contain any new theories, or any references to methods of construction or design which have not proved satisfactory in actual use. So that he may presumably be regarded as a fairly safe guide. But, if there is a lack of originality, there is a good deal of information, not easy to be obtained, brought into the book; and in dealing with his material, the author has endeavoured to make it useful to all who, whether technically or administratively, have the supervision of water-supply undertakings.

With this introduction, we will glance at the results of Mr Goodell's labours. The author deals first of all with surface water, and gives statistics as to the yield of catchment areas. He describes and illustrates the method of gauging brooks to ascertain their flow, and then offers a few remarks on the analysis of water. The succeeding chapters are devoted to storage. Beginning with earth dams, the author emphasizes the importance of bestowing the greatest attention upon their construction, as otherwise they may be a source of danger to people living below them. He considers the qualities of the materials employed in this work, and describes the minor details of reservoirs. Timber and masonry dams are next dealt with; and he then leaves the subject of construction, to indicate the special features of water drawn from rivers, ponds, and underground sources. Well-sinking is described at some length; and so are pumps and pumping machinery. A chapter is devoted to the air-lift method of raising water, which, though not by any means new, has been made a commercial success within the past few years. The clarification and purification of water receive due attention at the author's hands; but he declines to pronounce definitely as to the advisability of employing mechanical or sand filters. Each case must necessarily be dealt with on its merits, and after a careful study of local conditions, cost of plant, and other matters. Having procured, stored, and purified the water, Mr. Goodell explains how it is distributed. In these chapters he takes up the subjects of the flow of water in pipes, reservoirs and their linings, water-towers, and stand-pipes and their substitutes. On the question of the quantity of water to be provided, his figures of 40 to 60 gallons per head are rather higher than those to which we in England are accustomed. The provision of water for fires—a subject which, the author says, receives inadequate attention in books on water-works construction—is considered; a series of tables, containing the results of experiments with "fire-streams," extracted from the "Transactions" of the American Society of Civil Engineers, adding value to this part of the work. The concluding chapter in the book is devoted to the water-works department generally; the author touching upon financial matters, the checking of waste, and the maintenance of the works. The book, on the whole, presents a good idea of American practice.

GAS PAVILION AT THE PARIS INTERNATIONAL EXHIBITION.



ELEVATION.

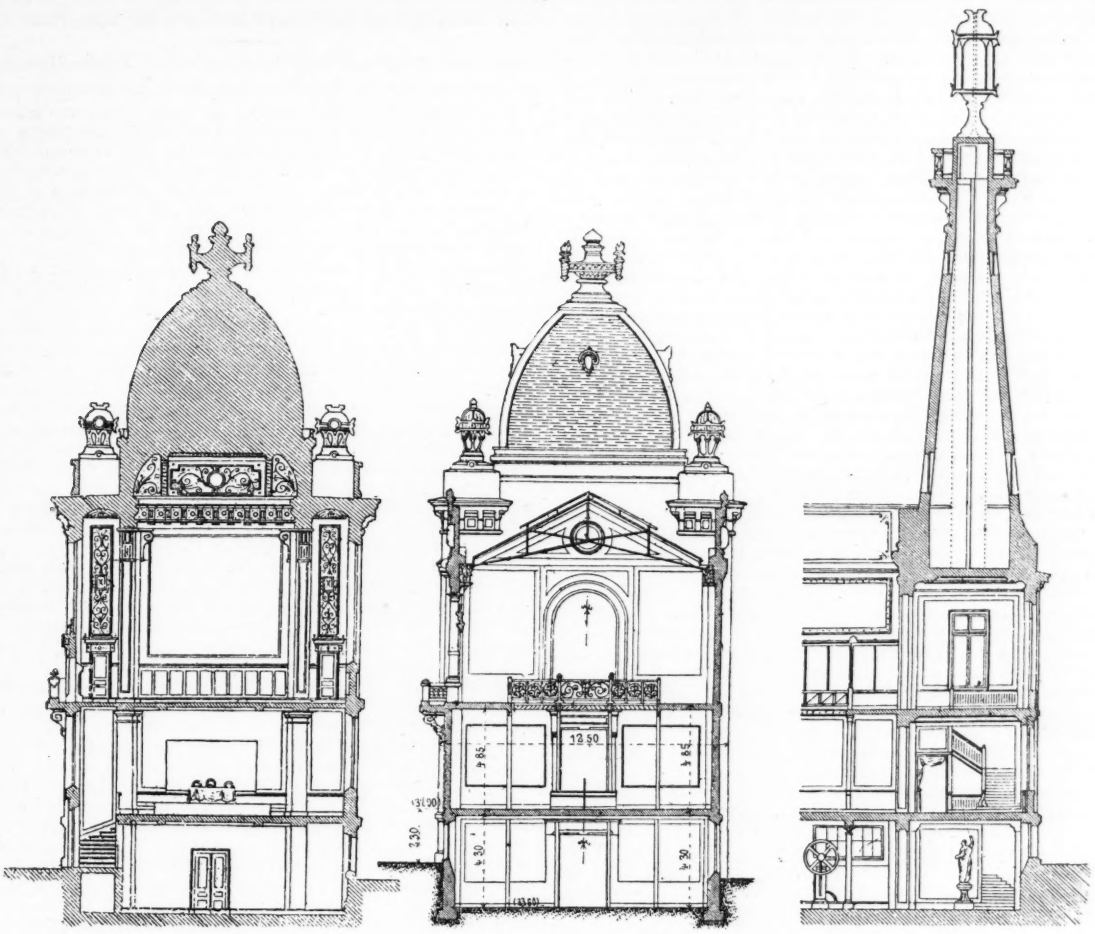
THE PROPOSED GAS EXHIBITION AND CONGRESS OF GAS ENGINEERS AT THE PARIS EXHIBITION.

IN previous issues of the "JOURNAL," reference has been made to the project set on foot by the Société Technique du Gaz en France to hold, in connection with the forthcoming Universal Exhibition in Paris, an international congress of engineers and others interested in the progress of the gas industry. An Organizing Committee was formed, with M. Vautier, the President of the Society, at its head; MM. Bertrand, Lebon, and Violle being the Vice-Presidents, and M. Delahaye the General Secretary. Among the foreign corresponding members are Dr. Bunte, Messrs. A. Dougall and W. T. Dunn, of the Gas Institute, Messrs. F. D. Marshall and J. W. Helps, of the Institution of Gas Engineers, Mr. G. G. Ramsdell and Mr. A. E. Forstall, of the American Gaslight Association, Herr A. Hegener, of Cologne, Herr C. Kohn, of Frankfort, Herr L. Körting, of Hanover, Herr W. von Oechelhaeuser, of Dessau, M. Pouchain, of Rome, Mr. Eugene Vanderpool, President of the Society of Gas Lighting, M. Solanges, of Milan, Herr Weiss, of Zurich, and Herr Wunder, of Leipzig. Other names will be added as soon as the necessary permission has been received by the Committee.

The date fixed for the congress is the 3rd of September and the two following days; and, with the view of making the gathering as successful and as profitable as possible, the Committee have issued a circular setting forth its objects, and inviting the co-operation of their colleagues. They point out that it will be the first international congress devoted solely to gas matters, and will afford an opportunity for an interchange of views on some of the most important questions connected with the manufacture and utilization of this universally employed agent for furnishing light, heat, and power. Moreover, it will favour the formation of private and professional friendships which cannot but be profitable to the industry at large. The Committee have not deemed it necessary at the present stage to settle definitely the programme of the congress. They have simply drawn up a list of questions which they consider may be usefully discussed; and they invite suggestions as to others. Promises of papers should be received by the 15th prox., and the text of the communications by the 1st of June, in order that they may be printed and distributed before the congress. They may be written in French, English, German, or Italian; but the Committee would prefer the use of the first-named language. The Congress card will cost 20 frs., and it will entitle the holder to attend all the meetings and any visits which may be arranged, and to receive a copy of the "Transactions" when published. The administrative and technical staff of the Paris Gas Company, the members of the Société Technique and those of the several Associations of Gas Managers who pay annual subscriptions, will be exempt from payment of this fee; but they will not receive the publications connected with the congress unless they are present.

Among the questions suggested by the Committee for discussion are the following: (1) The principal causes of incandescence with gas. (2) The photometry of the incandescent gas-light. (3) The relation between the luminous intensity of an incandescent burner and the lighting and heating power of gas. (4) The improvements effected in inclined retorts, the different methods of employing these retorts in large works and in various countries, and the technical and economical results obtained by this system as compared with machine stoking. (5) The prevention of naphthalene obstructions. (6) The relative advantages of dry and wet meters. (7) The best method of extending the use of gas for lighting, heating, and motive power, in competition with electricity and petroleum. (8) The encouragement of stokers in ensuring economy of retort-heating and higher yields of gas. (9) Professional training for foremen, deputy-managers, and managers of works. (10) The present position of motors actuated by ordinary or poor gas. (11) The chief causes of the increase in the production and utilization of the bye-products of gas manufacture during the second half of the nineteenth century.

In connection with the Exhibition, it is intended, as our readers are aware, to have on view a representative collection of gas appliances in a building specially erected for the purpose in the grounds, as was done on the occasion of the Exhibition held in 1889. It was thought by the Committee of the Société Technique that those who are engaged in the supply of gas should show they are quite capable of holding their own against their competitors, and that the best way of demonstrating this was to bring together under one roof samples of all the best appliances for the utilization of gas. An Executive Committee was formed, under the presidency of M. Eugène Lebon; M. Picard, the Commissary-General of the Exhibition, granted a site in the Champ de Mars for the proposed building; and plans for it were prepared by M. Georges Roussi, and approved by M. Picard. In order to obtain the funds necessary for carrying out the object, an appeal was made to parties interested in the projected demonstration; and 265,000 frs. (about £10,600) had been subscribed up to the end of last year. The Compagnie Centrale du Gaz (MM. E. & A. Lebon) head the list with 30,000 frs., and the Paris Gas Company follow with 20,000 frs.—



CENTRAL CROSS SECTION. SECTION THROUGH DOME. SECTION OF TOWER.

other companies and firms connected with the gas industry contributing sums ranging from 17,100 frs. down to 20 frs. A start was made with the building, which is now roofed in, and ready to receive the exhibits. It will be called, as on the previous occasion, the Gas Pavilion. A good idea may be formed of its architectural features from the accompanying illustrations, which have been reproduced from the current number of the "Journal des Usines à Gaz," to which we are indebted for the particulars here presented. It will be situated within a few yards of the Porte Rapp, and will stand parallel to the Avenue de la Bourdonnaye, so that it will not be any very great distance from the Eiffel Tower.

In the interior arrangements of the building, the object which the Committee have kept steadily in view has been to afford the general public facilities for forming an exact idea of the variety of uses to which coal gas lends itself. In the central portion of the Pavilion, in the basement, and on the ground and first floors, distinct installations will be arranged; the whole presenting for the inspection of the visitor all the known methods for the utilization of gas. The portion of the building surmounted by the dome will contain the rooms set apart for practical demonstrations and the meetings and conferences to take place during the congress, and also the laboratory. The basement is divided into two parts—the cinematograph exhibition room, and a room in which will be shown the appliances for the industrial and domestic use of gas. In the passage leading to the former room there will be fourteen compartments—two for culinary and heating appliances, one for a gas-engine (a dynamo and accumulators furnishing the current for the incandescent lighting in the exhibition-room and the arc light for the lantern views), ten for various kinds of gas appliances, and one reserved. The lighting will be by gas consumed under the ordinary conditions—*i.e.*, with flat-flame, argand, and incandescent burners of different consumptions. On the ground floor will be the great hall, situated above the exhibition-room. It will be so arranged as to serve for laboratory purposes as well as for cookery lectures and demonstrations; and it will be a typical example of lighting from the ceiling. The rectangular hall on the ground floor will be divided off into apartments in which the use of gas will be shown with prepayment meters, and as applied to boilers and stoves, the lighting of kitchens and dining-rooms, and for washing, ironing, and bath heating. The lighting of the hall will be done principally by Welsbach burners; and the centre will be occupied by stands upon which will be shown various models and samples of small goods, collections of burners, &c. The first floor consists of a double gallery leading to the conference-room. Along this gallery will be placed drawings and designs representing the progress of the gas industry in all countries during the past century. Glass cases will contain scientific and industrial publications, specimens of the raw material and residuals of gas manufacture, the secondary products of the latter, and other interesting exhibits.

The foregoing presents an outline of the general arrangements already made in connection with the congress and the collective gas exhibition. But fuller details may be had by applying to M. Th. Vautier, 65, Rue de Province, Paris.

MUNICIPAL MUDDLING.

THE year 1900 seems likely to witness a further development of the eager campaign of the Municipalities in the wide field occupied by industrial enterprise. More particularly is the policy of annexation foreshadowed in relation to Water Companies. To many county councillors, Provincial as well as Metropolitan, the idea of extended empire seems to possess a well-nigh irresistible attraction. Like Alexander of old, they sigh for new worlds to conquer—oblivious, too often, of the practical question of their fitness or unfitness to administer the additional territory after wresting it from its original proprietors. There is, however, one large town in which during the current year the Water Company, though long coveted by the Municipality, is likely to be left in peace and quietness. The Corporation of Portsmouth have for years past hankered after possession of the property of the Portsmouth Water Company. There have been many negotiations, reports, discussions, deliberations in Committee, meetings between Committee and Board of Directors—in a word, much cry and little wool. But the *status quo* remains unchanged; and, as we have said, it bids fair to show no alteration, at least for another twelvemonth. The truth seems to be that the Portsmouth Corporation are more ambitious than businesslike; and the extraordinary results of their interference with other local undertakings has lately attracted so much attention among the ratepayers that any attempt to buy up the water-works would, on popular as well as on financial grounds, encounter strenuous opposition.

A good many years ago, an Electricity Supply Company was formed in Portsmouth; and the usual application was made to the Board of Trade for a Provisional Order. Then, and not till then, the Corporation stepped in and exercised the prior right of claiming an Order which is conferred by the Electric Lighting

Acts on municipal bodies. In the result, of course, the Company's project had to be abandoned, and the shareholders lost the money already expended. It was represented that the Corporation would achieve great things with the electric lighting in their own hands. To put it mildly, they have not done great things. They have, however, a central station on which a large sum of money has been expended; and the possession of the station recently suggested to some brilliant committeemen the idea of utilizing superfluous motive power for the purpose of working the local tramcar service by electricity. In the first place, as a detail, it became necessary to acquire the tramways hitherto worked by horse power, and owned by the Provincial Tramways Company. To this end a Bill was promoted, and in due course was passed; thereby enabling the Corporation to take over and work the tramways undertaking on and from the 1st inst. But though the 1st of January has come and gone, the Tramways Company are still in possession of their undertaking. It appears that the Company also worked a number of omnibuses, and, as we gather from local journals, hearses and funeral carriages in addition. The Directors therefore contend that, if the Corporation take over the tramways, they must acquire the Company's undertaking as a whole. They decline to part with the tramlines and tramcars and at the same time to be left in possession of the omnibuses and hearses.

Hence a deadlock, which would be absolutely ludicrous if it were not such a serious matter for the ratepayers. The Special Act authorizing the transfer seems to be ambiguous in its terms; and already there is talk of litigation with the view of getting the Act interpreted, which would mean an expenditure of much money and no little loss of time. The outcome of this extraordinary example of blundering is difficult to foresee. One point among others is, however, admitted—viz, that apart from the controversy with the Tramways Company, another development of the original scheme will be necessary. There will be large outlay required for a new electric station. The existing plant is not, after all, to be available! However, the Corporation must catch their hare before cooking it; and they have not caught it yet. At the stroke of midnight on Dec. 31, 1899, the Committee attended in solemn form at the Tramways Office to take over the new purchase. They were received politely and regaled with champagne; but, otherwise, they were sent empty away. The Directors of the Company sit tight; and the Corporation have now to choose between costly litigation and the undesired acquisition of a number of omnibuses and hearses. If, in the result, they choose the latter, the hearses might appropriately be used for the funeral of their ambitions. They have, in truth, afforded an unusually grotesque display of meddling and muddling. Their achievements in respect of electric lighting and the tramway service scarcely justify the belief that they would improve on the present excellent administration of the local water supply.

Semet-Solvay Bye-Product Coke-Ovens in England.—The "Colliery Guardian" recently gave the following as the net return from 100 tons of English coal treated in Semet-Solvay bye-product ovens: 70 tons of coke, at 14s. a ton (less cost of raw coal, 4s. 9d. a ton, and labour, stores, &c., 2s. 9d. a ton), £15 12s. 6d.; steam raised (equivalent to that produced by 13 tons of coal at 3s. 6d.), £2 5s. 6d.; tar, 4·75 tons at 20s., £4 15s.; sulphate of ammonia, 1·25 tons at £7 15s. (less £3 for acid, labour, &c.), £9 13s. 9d.; light oil, 303 gallons, at 5d. (less labour, chemicals, &c.), £4 16s. 3d.—total return, £37 3s. Nothing has been allowed for establishment charges or for depreciation. The finished benzols have been calculated in the terms of light oil for the sake of convenience; and the figures are stated to be from actual practice. The net revenue per oven per annum in bye-products at present prices is, therefore, 1750 tons, at £19 5s. per 100 tons, or a net return of about 50 per cent. on the recovery or chemical portion of the plant—that is, on the sum spent to recover the bye-products.

Carelessness in the Use of Gas.—Mr. W. P. Gerhard, of New York, who is known in England as the author of some little books on gas lighting and fitting, deals, in the current number of "Cassier's Magazine," with some of the dangers arising from carelessness or ignorance in the use of gas. He expresses the opinion that, notwithstanding the universal introduction of gas lighting, there are still many persons who would be benefited by receiving plain instructions on the use of gas in the household, and that gas companies would benefit themselves and the public by paying more attention to this matter. He points out that, among available statistics, numerous instances may be found of death or accidents due to faulty management of gas. Among the more remote causes, he finds the following mentioned: In one of two adjoining rooms, supplied with gas from one prepayment gas-meter, a man retired for the night when the gas supply from the meter was exhausted, but forgot to close his gas-burner. The occupant of the adjoining room came home late at night, dropped a coin in the slot of the meter, and obtained a fresh supply of gas, which meanwhile escaped in the adjoining room, killing the occupant. Escapes of gas and explosions have also happened in the use of gas cooking-stoves, where boiling water, running over the vessel, extinguished the flame. The so-called independent gas connections, with two keys, may lead to accidents by the wrong one, from any cause, being turned by mistake.

THE COKE TRADE OF GREAT BRITAIN IN THE PAST YEAR.

In the first number of the "Iron and Coal Trades Review" for the present year, an article was devoted to the above subject. We learn therefrom that during the year there was a remarkable increase in the demand for coke, which, meeting a supply that could not be readily augmented to any very considerable extent, has caused an absolute scarcity of that product over a large part of the year. This increase of demand was more especially due to the larger output of pig iron, which probably absorbed about 500,000 tons in excess of the consumption of 1898. Foundry requirements were also materially larger; while the foreign demand was in excess of that of any previous year—due chiefly to the insufficient home supply available from the German blast-furnaces. The prices of coke steadily increased all through the year, until in December good blast-furnace coke was fetching 25s. per ton at the ovens, against 15s. to 16s. per ton at the beginning of the year. In some cases, for immediate delivery, higher prices have been realized. The pressure on coke manufacturers continues to be as great as ever, and still higher prices are regarded as probable. An increase of 9s. to 10s. per ton in the market value of coke was naturally keenly felt by consumers; and it induced some fears as to difficulties in adjusting the cost of the production of pig iron and foundry products to selling prices. Of the 20s. or so by which pig iron advanced during the past year, something like one-half went to the coke manufacturers. Under these circumstances, coke makers did a more profitable business in 1899 than any other class of manufacturers. To the same trade situation is due the fact that small coal available for the manufacture of coke greatly appreciated in value. Speaking generally, this description of coal has more than doubled in value since the beginning of 1899.

A large amount of attention continues to be given to the comparative merits of beehive and bye-products coke-ovens; and the latter systems made decided progress during the year. The principal processes now before the British coke makers are the Otto, the Simon-Carvès, the Semet-Solvay, the Coppée, and the Collin. With all these to choose from, it will be admitted that the coke industry has a sufficient range of choice. The Otto system, which is the one that has made such decided advances and is so largely adopted in Germany, has only lately entered the field in this country; but several important installations are already in hand. The same remark equally applies to the well-known Coppée system, which has established itself firmly in public favour, more especially in the South Wales coalfield. The total number of Coppée ovens built in this country up to the present time is 2296; and these are capable of coking from 50,000 to 52,000 tons of coal per week. The Semet-Solvay system has been taken up by ten of the principal coke manufacturing concerns in this country, and Mr. John H. Darby, who has the system in hand, is making steady progress with it. The Semet-Solvay coke-ovens which have so far been built in the United Kingdom number 425, and some 25 more are in course of erection. These ovens will have a capacity of more than 500,000 tons of coke per annum.

The Simon-Carvès system of coke-ovens with recovery of bye-products, which is now being developed by the Simon-Carvès Bye-Product Coke-Oven Construction and Working Company, Limited, of Manchester, was, it will be remembered, first introduced by their Chairman, the late Mr. Henry Simon, of Manchester, at Messrs. Pease's collieries near Darlington in 1882. This original installation, after seventeen years of continuous working, is still in operation. A large number of these bye-products coke-ovens have been built, not only by Messrs. Pease, but also at various other collieries and blast furnace works in this country; and similar installations are now being erected for the Barrow Hematite Steel Company, Messrs. John Brown and Co., Messrs. J. & J. Charlesworth, and the Monckton Main Coal Company. These ovens have demonstrated the small cost in maintenance which properly constructed bye-products coke-ovens entail—a circumstance which cannot be readily appreciated until ovens of this class have been at work for a long number of years. At the Wharncliffe Silkstone Colliery, one of the most modern installations of bye-products coke-ovens on the Simon-Carvès system was started some months ago. The installation consists of one battery of 35 ovens and the necessary apparatus and plant for recovering the tar, ammoniacal liquor, and crude benzol; also a plant for the manufacture of sulphate of ammonia. To supply these ovens, about 1400 tons of coal weekly, or say 72,000 tons per annum, are required. In addition to the valuable bye-products recovered from the gases in the process of coking, the quantity of coke made by this system from the same quantity of coal is considerably more than that obtained with the beehive ovens—an important factor in view of the present demand for blast-furnace coke.

The following figures, representing tons, will give an approximate idea of the joint capacity of production of the special systems of coke-ovens now in use in this country: Coppée ovens, 1,800,000; Semet-Solvay ovens, 500,000; Simon-Carvès ovens, 450,000; Otto ovens, 350,000; Collin ovens, 120,000—total, 3,220,000 tons. As, however, the total output of coke in the United Kingdom is probably not less than 14 million tons, it is obvious that there is a large field still to be cultivated in this direction.

WATER BILLS FOR 1900.

THE following Bills have been deposited in the Private Bill Office in respect to water supply.

The Bristol Water-Works Bill is chiefly to extend the powers of the Company for the protection of the purity of their waters. It is proposed to empower the Company to make and enforce bye-laws for ensuring the purity of any drainage area in which they are interested. Such bye-laws are to be sanctioned by the Local Government Board. Landowners and occupiers injuriously effected by the bye-laws are to be compensated. Certain agreements have been entered into by the Company and the Rural District Councils of Axbridge and Clutton with respect to this matter, and are scheduled in the Bill.

The Crowborough District Water Company's Bill is to transfer to, and vest in, the Company the undertaking of the Gas Company of similar name and nearly coterminous district. Additional capital to the amount of £24,000 is required, with the usual borrowing powers. The gas undertaking is to be transferred in consideration of the exchange of equal shares to the same nominal value, share for share. Any difference between the two Companies is to be settled by arbitration under the Arbitration Act, 1889. The accounts of the undertakings are to be kept separate; and the name of the Company is to be changed to the Crowborough District Water and Gas Company.

The Dorking Water Bill is to empower the Company to raise additional capital to the amount of £16,000, from which they are to repay the sum of £1667 expended out of revenue on capital account. The new issue is to be 7 per cent. ordinary or 5 per cent. preference capital, carrying the usual borrowing powers.

The East Shropshire Water Bill is to incorporate a Company with a share capital of £72,000, and power to borrow £18,000, for the supply of water to the parish of Shifnal and the neighbourhood, on the borders of Shropshire and Staffordshire. The supply is to be made effective in five years. The works to be authorized include wells and pumping-stations in the parishes of Blymhill, Sheriff Hales, and Shifnal. The powers of compulsory purchase of lands are to be for seven years. Rates for domestic supply are to range from 8 to 6 per cent., with 9 per cent. for inns. Water supplied for domestic purposes is not to be used for power, under a penalty of 40s. The maximum price for meter supplies is to be 1s. 6d. per 1000 gallons, with a minimum payment of 8s. per quarter.

The Exmouth and District Water Bill is to sanction the issue of £65,000 of additional 7 per cent. capital, with the usual proportion of loan. New works are to be constructed, including an impounding reservoir on Bicton Common for impounding the Budleigh Brook; and another at Withycombe for collecting the waters of the Dalditch Brook. The works are to be completed within five years.

The Fishguard Water and Gas Bill proposes to change the name of the Company to the North Pembrokeshire Water and Gas Company, and to extend the district of supply to the parishes of Newport and Dinas. Additional capital powers to the amount of £24,000, with the usual proportion of loan, are desired. Extra works are contemplated, including an impounding reservoir to be formed upon the Pontfaen Brook, partly in the parish of the same name and partly in the parish of Llanychaer. These works are to be completed within seven years.

The Great Berkhampstead Water-Works Bill is to incorporate with statutory powers a Company formed in 1864 for the supply of this district, on the borders of Hertfordshire and Buckinghamshire. An Order was obtained in 1885, under which the capital was defined as consisting of £7000 of 10 per cent. capital and £10,000 of 7 per cent. capital, with £4250 borrowed money. The existing capital is to be consolidated and converted into 4 per cent. ordinary stock, with the addition of £40,000 of the same stock. The borrowing powers are to be £8500 on the ordinary consolidated stock of £35,000, and one-fourth of the amount of the new issue. The existing water-works are to be maintained; and additional lands are to be acquired by agreement.

The Higham Ferrers Water Bill is to incorporate a Company for the supply of the borough named, in Northamptonshire, with a share capital of £72,000, and power to borrow £18,000. The works are to comprise a storage reservoir in the parishes of Sywell, Mears Ashby, and Ecton, with a pumping-station near the old Sywell Mill. The water to be taken is that of the Sywell Brook, a tributary of the River Nene. The works are to be completed in five years. The Local Authorities jointly, but not severally, are to be authorized to purchase the undertaking after twenty years. In this event, the arbitration is to be in accordance with the provisions of the Lands Clauses Acts with respect to the settlement of questions of disputed compensation; and the arbitrator is to have regard to the probable increase in the consumption of water, and consequent increase in revenue, for a period of not exceeding ten years from the date of the arbitration. Power is sought to lay mains in the district of Rushden, but not to supply water, except in bulk to the District Council. The rates for domestic supply range from 9 to 6 per cent.

The Llandrindod Wells Water Bill is to extend the limits of supply of the Company, and to authorize the construction of new works, mainly in the parish of Cefullys. The waters to be taken are those of several springs and brooks that can be collected by the proposed works; subject to the proviso that the Company shall allow sufficient water to flow into every usual water course below the works, so as to enable all persons who have hitherto had the use and enjoyment of the waters to continue the same. The works are to be completed within five years. The waters of the River Ithon are to be taken for power purposes, the Company erecting a 2-feet weir for this object; but the waters are to be returned to the river before it reaches a certain property. The rates for domestic supplies are to range from 6 to 5 per cent. The Company need £7000 of additional capital, to carry the usual borrowing powers.

The Mid-Kent Water Bill is to extend the limits of supply by the Company to include a large number of parishes named. The supply throughout the added district must be made effective within six years. New works are contemplated, including two wells and pumping stations in the parish of Charing. The Company desire to raise £55,000 of additional capital, with the usual borrowing powers. A clause is proposed for giving the Company authority to collect samples and make inspections for the purpose of preventing pollution of the sources of supply. The Company also wish to be empowered to acquire private water-works, wells, &c., within their limits, on such terms as may be agreed upon.

The North Warwickshire Water Bill is to enable the Company to extend their limits of supply to parishes and places adjacent to the existing statutory area. Additional water-works are contemplated, comprising two wells and pumping stations in the parish of Menden, and one each in the parishes of Stoneleigh and Weston-under-Wetherly. These works are to be completed within seven years. The Company require £20,000 of new share capital, with the usual proportion of loan.

The Rickmansworth and Uxbridge Valley Water Bill is to extend the Company's limits of supply over a scheduled district. Additional capital to the amount of £150,000 is desired, with one-fourth loan.

The St. Alban's Water-Works Bill is to authorize the Company to acquire additional lands and water rights and easements during the next seven years. The trustees or governors of settled estates are to be empowered to treat with the Company. The limits of supply are enlarged. The Company desire to raise £80,000 of additional 7 per cent. capital, with the usual borrowing powers. The Company propose to erect workmen's dwellings on their own land.

The South Essex Water-Works Bill extends the limits of supply to certain places within the rural districts of Billericay and Ossett. The Company desire to raise £400,000 of new capital bearing a 5 per cent. maximum dividend, with the usual borrowing powers. New works are to be constructed within five years, including pumping stations at Heydon and Horndon-on-the-Hill. Local Authorities interested in certain works are to have the right to demand supplies in bulk at a year's notice, in quantity not exceeding 25 gallons per head of population.

The Southport Water Bill is to enable the Company to raise £60,000 of additional capital. A high-level pumping-station and service tank are to be made in the parish of Aughton, to be finished within seven years. The completion of a service reservoir in a period exceeding the statutory limitation is to be confirmed.

The Sutton District Water-Works Bill is to enable the Company to acquire additional lands and take other measures for the protection of their sources of supply. It is intended to forbid any local authority or person sinking any new or deepening or enlarging any existing well or pumping-station within a scheduled area, which is the limits of supply of the Company. The Company are not to supply water outside their own limits.

The Westgate and Birchington Water Bill is to define and extend the limits of supply of the Company in agreement with a local rearrangement of parish boundaries. New adits are to be made for collecting water, subject to certain restrictions. The works are to be completed within seven years. The Company require £20,000 of additional share capital, with the usual borrowing powers.

The Wetherby District Water Bill is to enable the Company to extend their service to an enlarged district under the control of the Tadcaster Rural District Council, and to East Keswick, by consent of the Leeds Corporation. Additional capital to the amount of £40,000 is desired. Wells and pumping-stations are to be put down in the parishes of Bardsey-cum-Rigton, and Thorner and Barwick-in-Elmet. The works are to be completed in seven years. Special provision is made for severance and the acquiring of easements in regard to property.

The Woodbridge District Water Bill is to incorporate a Company with a capital of £20,000, and the usual borrowing powers, to supply such portions of the parishes of Woodbridge and Melton as are situated to the westward and northward of the Great Eastern Railway. The service is to be made effective within six years. The works to be authorized include a well and pumping-station in the parish of Woodbridge, and are to be completed within five years. The rates for domestic supply are to range from 8 to 6 per cent.

The Swiss Output of Carbide.—A recent report on the commerce and industries of Switzerland, states that 1720 tons of carbide were exported from that country in 1898, of which Germany took 1073 tons and France 346 tons. In the preceding year, only 736 tons of carbide were exported from Switzerland.

OBITUARY.

The death is announced, at the age of 56, of Mr. HENRY LEGG, who for about 15 years had been Manager of the Herne Bay Gas-Works.

The death is announced as having taken place at his residence, London Road, Yorktown, of Mr. THOMAS HUNTER, for many years Secretary of the Yorktown and Blackwater Gas and Coke Company. Mr. Hunter was 85 years of age.

The recent death is announced of Mr. JOHN HALLAM, who was connected with the Nottingham Water-Works for upwards of fifty years. He entered the service of the Water Company under the late Mr. T. Hawksley; and when the transfer of the undertaking to the Corporation took place in 1880, he went with it, and became the General Superintendent of the Water Department—a position which he relinquished about nine years ago. Deceased was in his 75th year.

PERSONAL.

Mr. C. P. MYERS, of Kirriemuir, has been appointed Manager of the Troon Gas-Works.

Mr. E. HOWARTH, of Milnthorpe, has been appointed Secretary and Manager of the East Ardsley Gas Company.

Mr. W. C. JONES has been appointed Engineer and Manager of the Brierley Hill Gas-Works, in succession to the late Mr. J. Ward.

Mr. C. E. GODDARD having relinquished the secretaryship of the Sunbury Gas Company, Mr. J. L. FLETCHER has been appointed his successor.

On the 4th inst., at St. John's Church, Putney, the marriage took place of Mr. HARRY H. JONES, Engineer and Manager of the Wandsworth and Putney Gas Company, eldest son of Mr. Henry E. Jones, of Stepney, with ALICE, younger daughter of the late Mr. Edgar Burstall.

Alderman GAINSFORD, being greatly occupied with his new duties in connection with the Derwent Water Board, has retired from the office of nominee Director of the Sheffield United Gaslight Company; and, at the meeting of the City Council last Wednesday, Mr. C. F. BENNETT was elected his successor.

The Directors of the Kingston-upon-Thames Gas Company have selected Mr. B. MARSH, J.P., who has for some years been Deputy-Chairman, for the position of Chairman, rendered vacant by the death of Mr. P. Jones. Mr. C. E. NUTTALL, J.P., succeeds Mr. Marsh; and Mr. S. BROWN, J.P., has been appointed to the vacant seat upon the Board.

The Hartlepool Gas and Water Company have appointed Mr. T. BOWER, who has filled the position of Engineer for fifteen years, Engineer and General Manager of the Company's undertakings, including Humsworth Burn. Mr. W. SCOTT, who has been for twenty-five years the Company's Assistant-Secretary, succeeds the late Mr. Trewhitt in the secretaryship.

At the meeting of the Institution of Civil Engineers last Tuesday, it was announced that Mr. DUGALD CLERK had been transferred from the class of associate members to that of members. The monthly ballot which took place on the same occasion resulted in the election of Mr. JAMES DEAS, of the Water Engineer's Office, Warrington, as an associate member.

Mr. S. G. ASKEW, of Llanrwst, has been selected, out of 45 candidates, for the position of Manager of the Droitwich Corporation Gas-Works. The retiring Manager, Mr. A. T. HARRIS, who has been appointed Engineer and Manager of the Market Harborough Gas-Works, has been granted an honorarium of £30 for extra services in connection with recent extensions and alterations at the gas-works.

Mr. W. R. WILSON, late pupil and assistant to Mr. T. N. Ritson, Engineer and Manager of the Kendal Corporation Gas and Water Works, has been appointed Assistant-Manager of the Colne Gas-Works. Mr. Wilson has passed the City and Guilds Examination (Honours Grade) in Gas Manufacture, and holds South Kensington certificates in organic and inorganic chemistry, building and machine construction, and light.

Mr. WALTER DONALDSON has been appointed Manager of the Lymm (Cheshire) Gas-Works. This is the Mr. Donaldson whose resignation from the position of Secretary and Cashier of the Longton Corporation Gas Department was intimated in our issue last week; and we are asked by him to point out, in order to prevent any misinterpretation of the reference we made to his brief tenure of office at Longton, that his abandonment of the position was not due to any strained relations between him and the Gas Committee or officials, but was entirely in consequence of his appointment to Lymm.

The Pig Iron Production of Great Britain and Germany: A Correction.—The figures quoted from the "Zeitschrift für angewandte Chemie" in the article on "Gas Supply in Germany" in the "JOURNAL" for the 2nd inst. (p. 22), for the productions of pig iron in various years in both Great Britain and Germany, should clearly refer to "thousands of tons" instead of "tons" as given in the article. The error was inadvertently transcribed without correction from a table which appeared in the pages of our German contemporary.

NOTES.

The Temperature of Incandescent Bodies.

The "Proceedings of the German Physical Society," give an account of estimations of the temperature of incandescent bodies made by Herren O. Lummer and E. Pringsheim. The law of radiation of black bodies was in the first instance determined as closely as possible by a radiometer, and measurements of temperature with the thermometer. The truth of the law was then assumed, and conversely the unknown temperature of various bodies was estimated. The incandescent bodies were enclosed in a hollow sphere, silvered and polished inside; and rays were allowed to pass out, through a small opening only, to the spectrobolometer. The observations showed that the temperatures of the bodies examined were as follows :—

	Absolute Temperatures.
Electric arc light	between 4200° and 3750°
Nernst lamp	,, 2450° ,, 2200°
Welsbach light	,, 2450° ,, 2200°
Electric incandescent light . . .	,, 2100° ,, 1875°
Candle	,, 1960° ,, 1750°
Argand lamp	,, 1900° ,, 1700°

Wind Pressure.

It would scarcely seem probable, on the face of it, that the modern practice of cycling would possess the property of teaching constructing engineers anything outside itself. Yet in truth a good deal of valuable mechanical science has been evolved from the experiences of cyclists. Not to mention anything an engineer can learn from the pneumatic tyre or the ball bearing, it is abundantly confirmed that the old chain and sprocket gear is a highly efficient means of transmitting power. One of the most valuable lessons of bicycling for the engineer, however, is the importance and valuation of wind pressure. The resistance of the air is the chief obstacle to the travel of the bicycle; and Professor R. C. Carpenter recently experimentally determined that this resistance corresponds well with the following formula: $R = \frac{AV^2}{200}$; where R is the resistance in pounds, A is the area exposed normal to the line of motion, in square feet, and V the velocity in miles per hour. It may be assumed that the same result applies to the case of wind and a fixed structure.

The Diesel Oil-Engine.

An important future is confidently predicted for the oil-engine, which is credited with being able to push the gas-engine hard as an economical prime mover of moderate size. Of all oil-engines, few have aroused so much theoretical interest as the Diesel engine, for the reason that the inventor claims to have based his motor upon a new theory of combustion. According to this proposition, steam and all other gas and air engines are defective in principle, and consequently imperfect in economy. Herr Diesel's idea is to compress the air charge to a very high degree, and then introduce into it the charge of combustible. This principle is theoretically applicable to any gaseous liquid, or powdered combustible; but actually up to now only oil has been used. A very large quantity of air is employed, instead of only so much as is required to ensure complete combustion of the charge. So much heat is developed by compression, that the charge is self-igniting. Experiments are in progress with coal gas and the cheaper gas made in producers. The Diesel engine is made for England by Messrs. Mirrlees, Watson, and Yaryan, Limited, of Glasgow. The consumption of Royal Daylight oil is stated to be 0·47 lb. per brake horse power per hour.

The Spontaneous Combustion of Coal.

Herr R. Grimm has made an interesting communication to a recent number of the "Zeitschrift für Angewandte Chemie," which has a direct bearing on the phenomena of the spontaneous ignition of slack coal. A quantity of coarse furnace refuse and flue dust containing a considerable amount of unburnt coal, was exposed for some time to the weather. The action of air and water, abetted by additions of hot refuse, produced incandescence within the heap, which assumed the appearance of a diminutive volcano. The surface opened in fissures 2 inches wide, in the lowermost parts of which could be seen beautifully shaped crystals of sulphur, and an incrustation of sal-ammoniac upwards of $\frac{1}{2}$ inch thick. Steam issued from the fissures; and sulphur and sal-ammoniac were deposited around them. The sulphur was in monoclinic crystals upwards of $\frac{3}{5}$ inch long. Ferric chloride was not detected in the sublimed products. The production of such products from the nitrogen and the sulphur of coal has been previously observed; but such fine crystals as were obtained in this instance have rarely, if ever, been noticed in similar cases. Ammonia salts constantly occur among the products of the distillation of coal; and Herr Grimm gives the following equations to explain the separation of sulphur from the mass:—

$$FeS + H_2O = H_2S + FeO.$$
$$2H_2S + SO_2 \text{ (arising from } FeS_2) = 3S + 2H_2O.$$

Rise in Price of Waste Fuel.

An instructive illustration of one of the commonest, yet at the same time least understood, operations of the economic law of supply and demand, is furnished by some observations of the "Engineer" on the course of the South Yorkshire coal trade in 1899. It is remarked that the vast development of the coke

trade of this region has been such as to render it of scarcely secondary importance to the coal trade itself. A great change has come over the values of all kinds of small coal, slack, and smudge, which has made the whole trade a profitable one. Large sums of money have accordingly been sunk in coke-ovens and appliances. The rise in coke for the year has been quite 50 per cent. But this is only part of the story. Great as has been the advance in the price of coke, the worth of slack and smudge coal has risen more. The latter commodity, which a few years ago was unsaleable at 6d. or 1s. per ton, is now worth 5s. to 6s. 6d. per ton at the pits, for coking. This has also caused a large number of disused thin-seam collieries and "day-holes" to be reopened and worked at a fair profit; whereas when prices were at their recent level, they lost money. A long range of over 100 coke-ovens which have lain idle, and have been in the hands of the bailiffs for over five years, were being delegated as the year ended. All this record is pregnant with meaning. Among other things, it goes to show what little reliance can be placedupon "rubbish" values for coal, or, indeed, for anything else which happens to be a temporary "drug." All schemes for utilizing waste products are liable to this revulsion—that as soon as a use is found for what was useless, its price goes up.

New York Street Railway Power House.

The street railway system of New York City has the peculiarity in common with the London tramways, that the cheap and hasty overhead trolley wire has never been permitted on Manhattan Island. People who have taken at their own valuation the electrical specialists committed to the advocacy of this method of tramway working, are seldom aware of the circumstance that the "backwardness" imputed to the Metropolitan tramways is paralleled in the Empire City of America. The reason is the same in both cases—the overhead trolley wire was not considered good enough for the streets of the capital. Delay, however, has not been so much time thrown away. The Metropolitan Street Railway Company of New York have been able to feel their way to the best system; and, having found this, the Company are acting upon their conviction in a characteristically whole-souled style. The modern development of the multiphase alternating-current system of generating and transmitting electricity at high potentials, and converting it at substations into 500-volt direct current wherever desired, has made it possible for the Metropolitan Company to locate the main generating station on the tide water. Here coal can be delivered and ashes removed at the smallest cost; while plenty of water is available for condensing. Consequently the new power-station of the Company is to be the biggest thing of the kind in the universe. Full particulars of the building and machinery are published in the "Engineering Record" for Dec. 23 last. It is instructive to learn that the Engineers of the Company are under no delusions as to the possibility of obtaining power cheaply by burning refuse fuel, or anything of this kind. The maximum capacity of the station will be 60,000-horse power, in units of 4500-horse power, manufactured by the E. P. Allis Company. The boilers are carried on three floors, with the coal-bunkers overhead. They are of the standard Babcock and Wilcox type, fitted with Robey automatic stokers. The current will be sent out at 6600 volts. Mr. F. S. Pearson was the Consulting Engineer for the work.

Facilities for British Inventors.—Mr. Ritchie, the President of the Board of Trade, has appointed a Departmental Committee "to consider various suggestions which have been made for developing the benefits afforded by the Patent Office to inventors, and report." It is to consist of Mr. F. J. S. Hopwood (Chairman), Mr. Edward Carpmael, President of the Chartered Institute of Patent Agents, Mr. C. N. Dalton, C.B., Controller-General of Patents, Mr. J. A. Kempe, Deputy Chairman of the Board of Customs, and Mr. S. E. Spring-Rice, C.B., of the Treasury. Mr. Arthur Neeves, of the Board of Trade, is to be Secretary of the Committee.

Mr. Boys' Lectures on "Fluids in Motion and at Rest."—At the third of the Christmas lectures on the above subject delivered at the Royal Institution last Tuesday by Mr. C. Vernon Boys, F.R.S., he dealt with the flow of water in pipes. After explaining how the flow could be doubled by the use of an expanding mouthpiece, the lecturer went on to speak of the cause of the noises heard in domestic water-pipes. The British plumber, he said, arranged these pipes with sharp bends; and the result was that at the corners the water attained a high velocity. Hence at these points the pressure became very low. Water, like other liquids, would begin to boil if the pressure were sufficiently reduced, without any application of heat, and when it was quite cold; and so water sometimes boiled in this way in domestic water-pipes. This fact having been experimentally demonstrated, the lecture was concluded with an account of the Venturi water-meter, which was described as one of the most beautiful inventions made in modern times to overcome an apparently insuperable difficulty. Its construction was based on the principle that if a water-main was constricted at a certain point, the pressure fell from the wide to the narrow place. From the difference between the pressures at the two points the velocity of the flow could be calculated; and thus, the size of the pipe being known, the quantity of water passing could be measured, as was automatically done by this meter.

TECHNICAL RECORD.

LABOUR-SAVING MACHINERY IN GAS-WORKS.

In an article which appears in recent issues of our American technical contemporaries, Mr. J. T. Westcott, Manager of the Economical Gas Apparatus Construction Company, Limited, deals with the subject of the improvements which have of late years been effected in the plant of gas-works, especially with reference to the saving of manual labour. In order to enable the reader to appreciate more clearly the nature of the labour-saving machinery at present in use, he gives first of all a brief survey of the earlier arrangements of gas-works, and then points out that the principal saving has been effected in the retort-house. He deals with this saving in connection with horizontal retorts operated by manual labour and by machinery, inclined retorts charged and drawn by gravity, and combined coal-gas and water-gas plants. He remarks that horizontal retorts charged and drawn by manual labour would scarcely come within the range of his article, except for the fact that recently the advantages of scoop charging and manual charging and drawing machines have been appreciated, even in small works. He explains that the scoops are usually arranged in a carrier suspended from an overhead trolley by means of a chain pulley; thus allowing the scoop to be taken to any point in front of the several beds of retorts, and raised or lowered to the height of any retort. The scoop is usually of steel, made in a half circle, and provided at the end with a small roller. It can be run on a little waggon to the coal-store, and filled and taken back to the retort-house, where it is placed on the carrier and charged. A roller in front of each retort permits of ease in manipulating. A still better arrangement is where the scoop runs, by means of an overhead trolley system, from the coal-store to the retort-house and back again, and is not allowed to be taken from the carrier to the waggon. This method is said to reduce somewhat the cost of the labour of carbonizing per ton; and an unskilled labourer can become a very efficient charger in a short time.

Passing on to deal with mechanical stoking, Mr. Westcott says: Manual charging and drawing machines are frequently worked in conjunction with conveyors, hereafter described, and at works larger than those where a scoop charger is used. There are various types of these machines, which vary in details, but accomplish the same purpose. Some charging-machines are made with adjustable, and others with fixed hoppers, all for the same purpose, and briefly as follows: The manual charging-machine is a square, upright frame on wheels, running on tram-lines laid parallel to, and in front of, the retort-bench. On one side of the machine is a hand-wheel and gear, by means of which it is propelled. On the other side is another hand-wheel and gearing for hoisting and unloading an adjustable coal-hopper from one tier of retorts to any other. The coal supply for the retorts is received into the adjustable hopper on the charging-machine, from the overhead fixed hoppers. The adjustable hopper, being suspended by means of chains, is free to move vertically between the four uprights of the frame. The charger, when out of the retort, rests on a light frame suspended from the coal-hopper. Directly over the charger, at the bottom of the hopper, is a feeder-box for supplying the charger with coal. The charger consists of a light carriage, running on three wheels, having two semicircular scoops at the bottom. The scoops are arranged to turn over in opposite directions, by the twisting of a long driving-rod about half way round in one direction. This charger goes half the length of the retort at one time, and enters the retort twice for a complete charge. A moveable platform is used for working the top tiers of retorts. The drawing-machine is similar to the charger in that it is propelled along tram lines in front of, and parallel to, the retorts; and it consists of a frame on three wheels. The hand-rake for drawing the charge is raised or lowered to the retort required by means of an adjustable bearer-bar parallel to the retorts, and guided by two of the frames of the drawing-machine. With this manual machinery, 45 retorts can be charged and drawn in as many minutes, without requiring half as much fatigue as ordinary hand labour would involve.

The author next shows how power machinery is applied to the charging and drawing of horizontal retorts; his remarks on this subject being as follows: In the manufacture of gas, it is necessary to bring the coal from the pit to the gas-works, from there to the retorts in which it is placed, and, after being subjected to a high heat, taken out as coke and removed to the yard. With the improved methods, this is accomplished by means of various types of machinery. The designs of the particular classes of conveying machinery required for the handling of all coal coming to and leaving the works need to be somewhat varied to suit the local requirements. There are several installations in vogue, and at a great number of gas-works partial installations. Sometimes the coal is elevated and conveyed by means of band conveyors; at others, by means of tray and pan conveyors; and at others it is brought to the works and deposited into self-tipping waggons which discharge into a coal-breaker. From here, by means of a chain bucket conveyor, it is elevated and discharged into another self-tipping waggon or buggy, running on an elevated tramroad extending over the entire length of the coal-sheds. When the buggy reaches the point for the proper trimming of the coal, it is automatically

discharged, and returned to the conveyor to be refilled. When the coal is brought by water instead of by rail, a chain bucket conveyor is sometimes used to remove it from the ship to the breaker, from which it is taken to the coal-shed, as previously described. The coal is delivered from the sheds to the retort-house by means of an inclined shoot discharging into a hopper, worked in conjunction with a bucket elevator which conveys the coal to buggies running on girders over the tops of the fixed hoppers in the retort-house. The coal is then discharged into these hoppers, which are arranged at the top along the entire length of the retort-house; thus making them available for any one of the settings. From these hoppers, it is fed into the adjustable coal-hopper of the charging-machine.

The power charging-machines are operated by steam, compressed air, or water, and are fitted with propelling gear for travelling up and down in front of the retorts. They are of various kinds. Some have fixed, others adjustable hoppers, which, by means of gearing, are raised or lowered to suit the various tiers of retorts. The weight of coal in a charge is regulated by a feeder-box, with which the hopper is provided. A frame suspended from the hopper carries the charger, which is driven in, and withdrawn from, the retorts by a compressed-air cylinder, a rack-and-pinion chain drum, and chains. The scoop of the charger enters each retort twice, turning alternately in opposite directions; thus ensuring the coal being deposited equally over the entire base of the retort. The hot coke is taken from the retort by drawing-machines, which are fitted with travelling and hoisting gear, by means of which the rake-bar frame can be raised and lowered to convey the rake-bar and head to the several tiers of retorts. They are fitted with compressed air and controlling cylinders, and rack-and-pinion chain drums for the various operations. The motive force—*i.e.*, air, steam, or water—is conveyed from the receiver, boiler, or accumulator, by means of suitable tubes and fittings, to the hose-drum in connection with each charging and drawing machine. The hose, leading from the drums to the machines, is especially designed to convey the force used. The drum works automatically, and the hose is supported at frequent intervals to prevent unnecessary strain. Sometimes the power is conveyed by means of endless wire or ordinary rope; the rope being overhead, and driven by a gas or steam engine placed in an adjacent room. The coal can be supplied to the charger and a full charge completed in the retort in 30 seconds; or 120 retorts may be charged per hour. This, in comparison with the old method, is a paramount economy of labour as well as of gas; the latter saving being due to the short space of time the mouthpieces are open. The coke is carried from the cellars of the retort-house to the outside of the building on a conveyor, where a douche of water is made to play upon it as it drops. It is then raised on an inclined conveyor to the coke-breaking machinery, which consists of a circular frame composed of perforated plates having different sized meshes, and placed at a suitable angle. Two railway waggons can be run underneath this screen; the small coke falling into one, and the breeze into the other. A third waggon, placed under the lower end, receives the larger pieces of coke that have traversed the entire length of the screen. It will be observed that, except for actuating machinery, no manual labour need be employed on the coal from the time it leaves the mines until, as coke, it leaves the gas-works.

With regard to inclined retorts, Mr. Westcott remarks that this method of carbonizing coal has been attended with many experiments and failures, but at the present time numbers of installations are working successfully, and additional ones are being erected. He goes on to say: Inclined retorts are placed at an angle of 29° to 34° for the best working; varying according to the physical condition of the coal. The coal is delivered in several ways to the overhead hopper in the retort-house by elevating and conveying machinery similar to that previously described. Some of the recent installations do away with the trimming of the coal in the yard. A measuring chamber is placed immediately beneath the coal-hopper, and one above each vertical line of retorts. The weight of the charge can be adjusted as required. The same quantity of coal is put each time into the retorts. Travelling shoots are provided for conveying the coal from the measuring chambers to the retorts. The charging is accomplished by simply drawing a lever, which allows the coal to fall from the measuring chamber down the shoot and slope of the retort, the impact being regulated by a wing placed in the mouth of the shoot. Usually a little assistance is required to draw the coke, owing to caking and other reasons; but, after it is once disturbed, it quickly runs down the slope, and discharges itself by elevating and conveying machinery. The retorts are charged and drawn by means of gravity, which dispenses with charging and drawing machinery. Very little is left to the discretion of the operator; and in the best installations, none of the coal or coke is handled by manual labour—the only labour required being for the placing of the shoot and the drawing of the lever.

On the subject of installations of ordinary retorts combined with carburetted water-gas plant, the author points out that any one of the three systems previously described may be used in conjunction with this plant. The last-named system of manufacturing gas is greatly in vogue in America, and is also being favourably considered by European engineers; many installations being at work in England and several on the Continent. Anthracite coal, or a portion of the coke, is taken from the yard and used in the generator of the water-gas plant for making gas; or, better still, the hot coke from the retorts is immediately used in the generator. In one or two instances, water-gas generators have been placed in the same building, and very close to the mouths of inclined retorts—a part of the hot coke discharging directly into the generators. The remainder of the coke is handled by conveying machinery. Mr. Westcott concludes this portion of his article by saying that carburetted water-gas apparatus possesses several advantages not found in the manufacture of coal gas, some of which are the high candle power gas that can be made and the small amount of labour needed. The plant itself requires much less ground-space, and usually, for the same capacity, a smaller expenditure of capital.

With reference to the proportionate quantity of gas which can be made by one man in a working day by the various systems considered, including all labour upon the works, Mr. Westcott gives the following figures: Horizontal retorts, charged by hand, 17,000 cubic feet; manual charging and drawing machines, 25,000 cubic feet; power do., 30,000 cubic feet; inclined retorts, 35,000 cubic feet; carburetted water-gas plant, 50,000 cubic feet.

The remainder of the article deals with the rest of the plant used in the manufacture of gas; reference being made to the raising of the purifier covers and the conveyance of the purifying material by machinery, and also to the regulation of the governors by means of clockwork or electricity, as instances of the use of labour-saving appliances in gas-works.

A NEW INCANDESCENT GAS-BURNER.

The Intensified Gas-Light Company, Limited (whose high-pressure system we have frequently noticed), have introduced a burner for incandescent lighting at ordinary gas pressures which is worthy of a trial by gas engineers in comparison with other makes. We have seen the burner in use, and were pleased with its achievement. Its special feature is the manner in which the air is admitted and directed on to the current of gas as it issues into the burner. The gas-injector in the stem of the burner is conical in form; and the lower of two rows of air-ports in the case are drilled at an angle following that of the exterior of the gas-injector. Consequently, the air passing in these lower inlets takes an upward course, and converges on to the point at which the gas is injected. In other forms of incandescent burners, the air passes into the burner in a lateral direction, and then turns upwards, which must cause a little friction. To what extent this is detrimental, we do not know; but any impediment to a direct air supply cannot be an advantage. Therefore, the Intensified Gas-Light Company must be credited with having made an improvement in this respect; and to it is largely ascribed the high duty obtained by the burner. The upper part of the burner is detachable from the lower; and through the two portions forming the joint is another circle of air-holes, which may be partially or wholly closed by simply turning the upper part of the burner. In this way, the air supply can be readily adjusted to suit gas of any quality. The mantles used with the burners are the "C" Welsbach, which are supplied under a licence which the Company hold with the Welsbach Company. The consumption of gas varies from 2½ to 3½ cubic feet per hour; and the duty obtained is placed at from 23 to 25 candles per cubic foot, according to the quality of the gas. Tests corroborating this have been carried out, with some of the first burners made of this type, by Mr. C. Buckley, the Corporation Gas Inspector of Leeds; and he is making further experiments at the present time. The stems of the burners are cast; and the whole is well finished. They have a good appearance, and it is safe to predict for them a long life in use. They are suitable for both street and interior lighting, and are supplied with or without a bye-pass.

THE DRESDEN WATER-WORKS.

Recent numbers of the "Engineering Record" have contained articles on European sanitary engineering by Mr. J. H. Fuertes, a member of the American Society of Civil Engineers. In the issue of that publication for the 30th ult., he described the water-works at Dresden; and the following particulars are extracted from the article.

Prior to the year 1875, Dresden was supplied with water from public and private wells and from springs. Some parts of the city also had an auxiliary supply of questionable quality for trade purposes. In 1875, the works at Loschwitz, which were erected in four years from the plans of Herr Salbach, the Consulting Engineer, were opened, and the older supplies were abandoned. The water is obtained a considerable distance from the city on the right bank of the River Elbe. It is collected in a long perforated pipe paralleling the shore of the Elbe, and is supposed to come from under the Stadt-wald—an extended tract of uninhabited land belonging to the city, and lying on the hill above the works. The water-level in the wells is permanently lower than the bed of the Elbe; and the fluctuation in the level of the river does not affect that of the water in the wells. When the pumps are running at their normal speed, the water-level

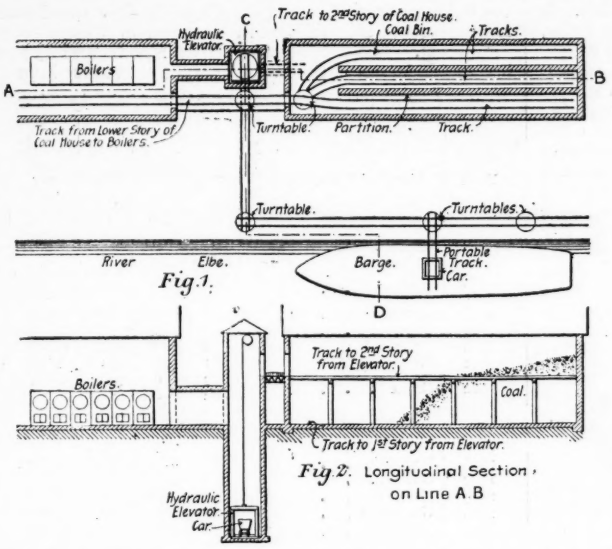


Fig. 1.

Fig. 2. Longitudinal Section on Line A B

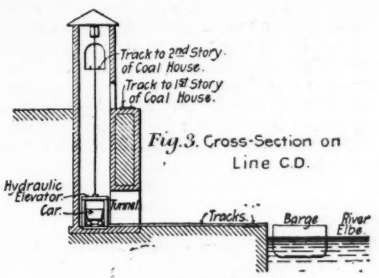


Fig. 3. Cross-Section on Line C.D.

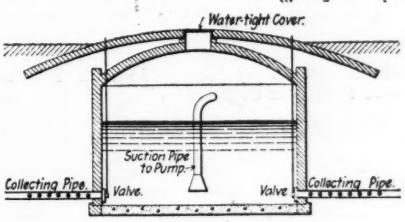


Fig. 4.

in the wells falls something like 3 feet. The water is taken by the pumps from two main wells, each about 23 feet in diameter and 16 feet deep. The collecting-pipes which feed the wells follow the river bank in each direction; the total length being about 4700 feet. On this line of pipe are six smaller wells, each about 8 feet in diameter. These wells are all lined with cut sandstone masonry, plastered water-tight with cement mortar, and covered with cast-iron tops. The perforated pipe diminishes in size as it gets farther from the pump-wells; reducing from a diameter of 25½ to 22 inches, and then to 18 inches. A section of one of the wells and pipe is given in fig. 4. Each section of pipe has valves for regulating the flow of the water to the pump-well.

There are three complete sets of pumps, two in each set, and each set is rated at 170-horse power. There are two suction-pipes and two force-mains, each 25½ inches in diameter. The latter lead to the reservoir on the hill about 200 feet higher than the works. The valves and bye-passes are so arranged that either pump or any combination of the pumps may act independently or in concert, and draw through either suction-pipe or deliver through either force-main. The boilers are smoke consuming, and have stepped grates with inclined fires and an artificial draught of hot air.

The reservoir is divided by a partition in the middle into two basins, so that one may be cleaned while the other is in service. Each section is cleaned about once a year. From the reservoir, a 25-inch and a 30-inch pipe lead to the city. It will be seen that everything is in duplicate; and this reduces to a minimum the danger of an interruption in the supply of water to the city. The height of the water in the reservoir is recorded continuously by an automatic recording device situated in the engine-room, and operated electrically.

The River Elbe is closed to navigation in the winter, and as all the coal used at the works is delivered by boat, it is necessary to provide for storing enough to last through the cold season. In order to have the coal stored above the flood height of the river, it is necessary to elevate it about 30 feet after unloading from the barges. Fig. 1 shows a ground plan, and figs. 2 and 3 sections of the coal-store. The boats are unloaded into small cars running on a track along the river. The cars are pushed to an elevator which raises them to the store, which has a double system of tracks for the trucks—one on the floor at the same level as the boilers, and the other about 9 feet higher and above the lower tracks. Turn-tables at all the junctions and crossings of the tracks enable the cars to reach any part of the house.

These works, which cost nearly £400,000, have in late years been taxed very heavily to deliver enough water to supply the demands of the city; and in 1894, Herr Salbach prepared plans for additional works to be located on the other side of the Elbe, and farther up stream. These plans, with certain modifications suggested by the Water-Works Authorities, and by the Consulting Engineer to the city, Herr Klette, to whom Mr. Fuertes was indebted for many professional courtesies while in Dresden, were approved in 1895. As in the older works, the water is to be derived from underground sources; but the manner of collecting it differs from the plan adopted at those works. In the new ones, it is to be collected in a number of wells, and pumped directly from them to a reservoir. Each well is to be sunk on a cast-iron shoe 16½ feet in diameter and 14 feet high. The shoe will be perforated by a system of slots to admit the water, and is to be treated with an asphalte coating on all the surfaces. The cast cylinder is to be sunk into the water-bearing layer of gravel, and will carry on its top a water-tight masonry wall laid in cement mortar, which will extend about 5 feet above the ground. The well will be covered with a cut granite top having a water-tight removable iron cover. A suction-pipe, 14 inches in diameter, with a foot valve at the lower end, will reach to within about 6 feet of the bottom of each well. The weight of the pipe will be carried by a girder spanning the well. The ventilation of the wells will be provided for by a system of pipes. The suction-pipes from the different wells will be coupled together and provided with the necessary valves, so that any well may be placed in service or in reserve.

THE INCRUSTATION OF IRON PIPES AT THE TORQUAY WATER-WORKS.

In the "JOURNAL" for Oct. 31, we noticed very briefly the paper on the above subject read by Mr. W. INGHAM, the Borough Water Engineer of Torquay, at the meeting of the Institution of Mechanical Engineers on the previous Friday, in the new buildings of the Institution at Storey's Gate, St. James's Park. We now give practically the whole of the paper, which is on a subject dealt with by the author at the meeting of the British Association of Water-Works Engineers rather more than two years ago.

The water supply to Torquay, Newton Abbot, St. Mary Church, and Cockington is obtained from a tributary of the River Teign, which rises in the granite hills on a western spur of Dartmoor. Two storage reservoirs, containing 297 million gallons, have been constructed there, and the water is conveyed by two cast-iron mains to Torquay. The old main, laid in 1858, is 14 miles in length, and was first scraped in 1866. It is 10 inches in diameter as far as Newton Abbot, and 9 inches forward to the foot of Chapel Hill, where it is reduced again to 8 inches between that point and the service reservoir. This main was not coated with any protective material; and within twelve months of being laid, it began to show signs of corrosion. Dr. Angus Smith's coating was unknown at the time the pipes were laid, and no one thought that the pure water from the Dartmoor hills would cause such a quick and deleterious action on the pipes. It was therefore with considerable surprise that at the end of eight years the delivering power of the mains should be reduced to 51 per cent. of their full discharging capacity.

A report was then submitted by the Engineer; and the question of taking up the pipes in ¼-mile sections and coating them was considered. But as this was thought to be too expensive, some other way out of the difficulty had to be found. It was at this period that Mr. Appold was consulted, and the idea of sending a scraper through the main was first suggested; and, being accepted, he received instructions to have a scraper made. The outcome of this was the scraper shown in fig. 1, p. 148. The subsequent improvements (figs. 2 and 3) were due to Mr. Box and Mr. William Froude; and the scrapers have not been altered since 1873. The scraper now in use is fig. 3. It is 3 ft. 8 in. in length, and consists of two parts; the front portion being the knives and springs supported by a framework, and the rear two pistons. These pistons are made of brass, and are about 1 inch less in diameter than the pipe. Immediately behind these pistons are leather discs strengthened by segmental iron plates. They are made rather larger than the diameter of the pipe; and the pressure of the water acting on them propels the machine forward. The rear portion of the scraper is connected to the front by a swivel joint, which has a considerable amount of play so as to pass round curves easily. Just in front of the joint there is a cylindrical guard, formed of flexible steel segments, which protects the piston leathers. The steel knives are four in number, and are kept in position by steel springs. From the nose of the scraper four pieces of steel project backwards, which serve to keep the scraper concentric with the pipe. The knives press outwards against the inside of the pipe with a force of about 48 lbs.; and, having a backward as well as a radial motion, they give way on meeting a projection which causes a pressure on the point of the knife of 60 lbs.

The knives are rather more than one-fourth of the circum-

ference in length, and are in pairs diametrically opposite to each other; one pair being about 4½ inches in advance of the other. They are V-shaped, and the scraper moves bodily round if they meet with a ferrule or anything of that kind. The two pistons already referred to are placed at such a distance apart that they will cover the largest hole of any branch-pipe from the main; otherwise the water would rush past the pistons and cause the scraper to stop. The force required to drive a 10-inch scraper at Torquay is from 350 to 400 lbs., or about 5 lbs. per square inch; but for the smaller scrapers the pressure required would be much more, because the area of a small pipe compared with the circumference is much less than in the larger sizes. For instance, comparing a 6-inch with a 10-inch, the area of the 6-inch is 28·3 inches, and the circumference is 18·86 inches; while that of a 10-inch is 78·6 and 31·4 inches respectively. The ratio of the area to the circumference in the 6-inch pipe is nearly 1½ : 1; and in the 10-inch, 2½ : 1. Therefore, if 400 lbs. would move the 10-inch scraper, 667 lbs. would put the 6-inch in motion if the rust were similar in both cases.

FIG. 1. FIG. 2. FIG. 3.

At the Torquay Water-Works, the scraper is inserted where the head due to water is only 3 feet; but when the wash-out pipe in front is opened, a partial vacuum is created, and the actual head is then 3 feet *plus* the difference between the atmospheric pressure and the pipe pressure in front of the scraper. Where scraping is necessary, it is not advisable to have the radii of curves in the pipe-line under 30 feet, although in well proportioned scrapers 15 times the diameter of the pipe will be sufficient. For pipes under 5 inches in diameter, water-pressure scrapers cause considerable trouble, and do not act very well. In laying pipes which will eventually require scraping, it is recommended that the jointing be carefully watched, to see that no lead finds its way into the pipe. Stones, chisels, and rubbish of all kinds are taken from newly-scraped mains, and cause considerable annoyance and trouble before the wash-out or hatch-box is reached. Before scraping is commenced, pipes and double collars should be placed alongside the main, in case the scraper sticks and the pipe has to be cut out. Cutting tools, spades, picks, lead, yarn, fire-basket, hand-pump, and a full complement of pipe-laying tools, should accompany the men when scraping.

The approximate cost of scrapers, hatch-boxes, and wash-outs may be taken as follows:—

	10-Inch. Each.	6-Inch. Each.	4-Inch. Each.
Scraper complete	£23 0 0	£10 10 0	£1 15 0
Hatch-boxes	6 6 0	4 0 0	2 0 0
Wash-outs	5 0 0	3 10 0	2 10 0

A 6-inch wash-out will be quite sufficient for a 10-inch main, a 4-inch for a 6-inch, and a 3-inch for a 4-inch. The 4-inch scraper would be of the Kennedy pattern. It is difficult to give the price of scraping any main, without knowing the full particulars of the pipe-line; but the following list, taken from Mr. Barr's paper on the "Scraping of Water-Mains," read before the Institution of Engineers and Shipbuilders in Scotland in March, 1897, will be of interest. The cost of scraping at Kendal and Torquay have been added; but in the latter case the cost is for labour only.

TABLE I.—*Summary of Scraping Water-Mains by Water Pressure.*

Year.	Name of Place.	Diameter of Main.	Length or Main.	Total.	Cost per Yard.	Gain in Delivery after Scraping.
		In.	Miles Yards.	£	d.	Per Cent.
1877	Oswestry	7	1 440	121	2·93	54·40 (*a*)
		6	4 660			
1878	Lancaster	8	1 1500	30	2·20	56·10 (*b*)
1880	Durham	12	1 586	91	9·10	.. (*c*)
1880	Bradford	18	4 1100	634	18·60	55·60 (*d*)
1881	Halifax (N.S.)	12	1 573	91	9·30	..
1882	Exeter	10	2 0	192	6·50	..
		12	2 0			
1883 1885	Whitehaven	13	2 1056	516	11·10	27·60 (*e*)
		11	3 1232			
1885	Bristol	6	1 785	35	3·30	.. (*f*)
1886	Denbigh	6	1 880	150	13·60	.. (*g*)
1887	Omagh	6	2 792	53	2·90	300·00 (*h*)
1887	Halifax	6	0 776	21	6·50	..
1888	Ulverston	6	1 0	72	9·80	..
1890	Dundee	15	2 0	256	17·40	.. (*i*)
1890	Dumfries	9	1 0	113	3·00	.. (*j*)
		8	4 0			
1890	Scarborough	8	1 440	62	6·70	..
1891	Newport	10	0 1080	50	11·10	.. (*k*)
1891	Lanark	7	6 880	75	1·57	33·70 (*l*)
1891	Guisborough	6	1 0	36	1·84	..
1891	Newport	5	0 75	8	..	..
1892	Rouboux	24	5 594	242	6·10	‡
1892	Burntisland	8	3 1320	252	9·02	43·00 (*m*)
1893	Bridge of Allan	6	1 0	..	..	35·00
1893	Thurso	6	3 0	..	..	7·00
1894	Stirling	8	3 1320	..	..	.. (*n*)
1894	Inverkeithing	5	2 880	..	..	.. (*o*)
1894	Waterford	13	8 0	211	3·11	40·00 (*p*)
1895	Cupar, Fife	7	3 880	67	2·60	52·00 (*q*)
1895	Merthyr Tydfil	14	5 617	318	8·01	30·00 (*r*)
1896	Cowdenbeath	6	3 1405	90	3·26	23·00 (*s*)
1896	Merthyr Tydfil	12	6 770	178	3·76	82·00 (*t*)
1896–7	Kendal	6	1 1430	54	4·08	.. (*u*)
		4	0 830	22	6·32	.. (*v*)
Yearly*	Torquay	10 & 9	14 0	†	0·10	28·00 (*w*)
1896	Do.	10	15 0	21	0·20	28·50 (*x*)

* Commenced in 1866. † The total cost of the scraping in 1866–7 was no less than £1200. ‡ 16-feet head taken off pumping-engine.

Obstructions.—(*a*) Large stones, lead, and defective pipes. (*b*) Peaty matter. (*c*) Lead, spade, hard spike, and waggon spring. (*d*) Stones, lead, crow-bar, &c. (*e*) Mussels, stones, and lead. (*f*) Stones. (*g*) Stones, gravel, and lead. (*h*) Lead and defective castings. (*i*) Wood and stones. (*j*) Stones. (*k*) Lead. (*l*) Lead, wood, and stones. (*m*) Piece of wood 2 ft. 3 in. by 5 in. by 5½ in., lead (4½ lbs.), and stones. (*n*) Stones and lead and piece of broken pipe. (*o*) Lead. (*p*) Pieces of broken pipe, rope. (*q*) Piece of broken rope, rabbit. (*r*) About 400 stones. (*s*) Lead. (*t*) Pieces of broken pipe, lead, and stones. (*u*) Lead, rust, and peaty matter. (*v*) Rust and peaty matter. (*w*) Rust in the form of nodules. (*x*) 35 lbs. of lead, stones, &c.

In comparing the cost of scraping, the length of the main should be taken into consideration, for it will be found cheaper to scrape long pipes than short ones. If the pipe is an uncoated one, a greater force will be required to remove the nodules than in the case of those which are coated. The first scraping will also be found more difficult than the subsequent ones; and, once commenced, the pipes require scraping afterwards at short intervals. At Torquay this is done on both trunk mains every year, and the delivery is increased about 28 per cent. even after so short a period. The scrapers can be easily followed, when the mains are about 3 feet deep, by the rumbling noise they make. There is a considerable variation in the sound made when passing over different classes of land; but the men soon get used to it. As a rule, seven men take part in the scraping at Torquay, and these are placed 20 or 30 yards ahead of one another, and run along as the machine progresses. The reason of so many men being required is owing to the variations in the speed of the scraper, for if it rushes past any one or two of them, the next man ahead locates it. If the scraper is lost, there is considerable trouble in finding it again; so it pays to have a few extra men about to avoid losing it. Moreover, if the scraper sticks, they are required to excavate, and cut out the pipe. If the scraper stops, it is usual to open the last wash-out, and then shut it quickly. The impetus thus obtained often carries it past the impediment; but care should be exercised to see that the ram action is not too great, to force the pipe-joints or to burst the pipes. Should this be unsuccessful, a wisp of hay may be inserted, which makes practically a water-tight piston, and thus increases the pressure on the scraper. If this fails, tapping the main with a hammer where the scraper has stuck often causes its release. When these methods have been tried and end in failure, the only course is to cut out the pipe. If desired, the scraper can be examined at any hatch-box by inserting an iron cup to catch it. If after examination it is found in good condition, the hatch-box cover is bolted down again and the work recommenced. Where wash-outs are necessary in towns, they

are usually connected with the sewer; and if this is done, it is advisable to trap the sewer, and construct a brick pit, with a ventilating grating so as to allow the escape of sewer gas if the water of the trap is evaporated.

The depth at which the old main from the Tottiford intake to Torquay is laid is about 3 feet, except for a distance of 180 feet, where it increases to 18 feet at the deepest point. The difference in head between the intake and the lower or Chapel Hill service reservoir is 468 feet; and the average gradient is 1 in 157. The first hatch-box is about eight miles from the intake, and the second one at the foot of Chapel Hill, at Torquay, nearly six miles farther on. Wash-outs are placed at the bottom of all valleys, and the speed of the scraper can be regulated by opening or shutting down the valve. The scraper moves more quickly when on a down grade than it does on an up grade, due to its weight (132 lbs.). Air-valves are placed on most of the elevations; and it may be of interest to know that these have a considerable effect on the speed of the scraper. They ought to be shut off when the scraping is in hand, because the air rushes in when the water is withdrawn from the pipe; and instead of a partial vacuum we get the atmospheric pressure against the scraper. These air-valves were fixed in 1897, and since then the amount of corrosion has decreased somewhat. This is probably due to the gases escaping instead of being carried along by the water.

The cost of scraping the old main is about £10, and works out at 0·1d. per lineal yard. This is a very low figure, and is perhaps the cheapest piece of scraping in the country. The men engaged are thoroughly in touch with the work, and no difficulty is experienced in following the scraper at any part of the line, except for about 180 feet where the pipe is some 18 feet below the surface of the ground. The scraping is done during the day; but where the line passes through Newton Abbot, operations are commenced early in the morning, before much traffic is on the road. It is very exciting to follow the scraper over hill and dale, and especially so if the wash-out pipe in front has been fully opened. A speed of 7½ miles per hour can be obtained for about three-quarters of a mile on one part of the line.

The theoretical delivery of the old main is 595 gallons per minute according to Box. Prony's formula gives 616 gallons per minute. The following table gives the discharges of the mains before and after scraping:—

TABLE II.—*Delivery of Mains before and after Scraping.*

Year.	Old Main, Laid in 1858.		New Main, Laid in Sections from 1878 to 1891.	
	Delivery in Gallons per Minute into the Chapel Hill Reservoir.		Delivery in Gallons per Minute.	
	Before Scraping.	After Scraping.	Before Scraping.	After Scraping.
	Gallons.	Gallons.	Gallons.	Gallons.
1866	317	454	..	..
1867	—	564	..	..
1868	—	624	..	..
1869	423	659	..	..
1870	471	668	..	..
1871	496	684	..	..
1872	499	681	..	..
*				
1896	550	698	516	663†
1897	600	693	..	..
1898	586	708	705	835‡
1899				

* No records. † Delivery into Warberry reservoir. ‡ Delivery into Chapel Hill reservoir.

Eight years after the pipes were laid, the delivery was only 317 gallons, or 51 per cent. of Prony's delivery, the head lost being about 351 feet. The present delivery, after scraping, is 708 gallons per minute, or 92 gallons more than given by Prony's formula. This increase can only be accounted for by the corrosion of the main itself, and as the delivering power of a main varies as the 2·5 power of the diameter when head and length are constant, the main must have been enlarged from 10 to 10½ inches diameter in 41 years.

After twelve months, it is found that the nodules are about ⅛ to $\frac{3}{16}$ inch in height; but the effect is such that the 10-inch pipe has only the delivering capacity of a 9-inch one. This is due to the eddies developed in the water by the nodules, and also to the much larger surface exposed to friction. For instance, taking a pipe 10 inches in diameter which is covered with nodules as in fig. 4 (which shows the incrustation in one year), the surface exposed to the friction would be approximately 35 inches, whereas the circumference of the pipe would be only 31·4 inches; the increase being about 11 per cent. Working out the cubic contents of the nodules as shown on the section, it is found that 24 cubic inches of rust is formed per lineal foot of pipe; and as the length of the main is 24,352 yards, we get 1014 cubic feet of nodules. Now, as the nodule contains 49·03 per cent. by weight of iron, and a cubic foot of the incrustation weighs 93 lbs., the total loss of iron in the whole length of the main is no less than 21 tons per annum. This can be checked by taking the area of the inside of the main and multiplying it by ¼ inch, which is the thickness of the iron lost by corrosion in 41 years. This calculation gives 20·5 tons for one year, and compares very favourably with the first one, being only about 2½ per cent. lower.

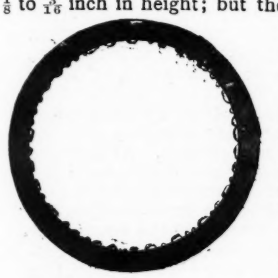


FIG. 4.

If, before the scraping is commenced, a pressure-gauge is fixed at different points in the pipe-line and the pressure plotted on a section, the condition of the pipe can be arrived at by comparing it with the theoretical hydraulic gradient of the pipe. The points on the section will show certain dips below the theoretical gradient, owing to the greater loss of head due to friction. If the dip is gradual, it shows that the rusting is even throughout; but if the line rises and falls, the rusting will be worse where the dip is largest, and smallest where it is least. Special obstructions, such as a badly-run joint or a heap of stones, would only show the dip at that point, and would recover itself immediately after passing it.

[The author produced a diagram showing the theoretical gradient of the main and also that due to incrustation. The state of the pipe was seen to be worst at a point about three miles from the intake; while it was in fairly good condition two miles from the Chapel Hill reservoir at Torquay. He explained that the greater corrosion on the first section of the main was probably due to two causes—first, to the water being impregnated with a higher percentage of gases on the first section, which increased the corrosive action; and, secondly, to the mains being washed out more at the end nearest the town, and some portion of the rust being washed away.]

During the summer of 1896, it was found necessary to scrape the new 10-inch main (which was coated with Dr. Angus Smith's composition) for the first time; and the deliveries into the Warberry reservoir before and after the scraping were 516 and 663 gallons per minute respectively, giving an increase of 28·5 per cent. For scraping purposes, this main is divided into two lengths similar to the old main. It was laid in sections as required, having been commenced in 1877 and completed in 1891. The difference in head between the intake at Tottiford and the Warberry service reservoir is 306 feet, and gives a hydraulic gradient of 1 in 264. During the scraping operations, the scraper got safely through; but on arrival at the first hatch-box—eight miles from where it was inserted—it was found to be broken and badly strained. When, however, it is mentioned that 35 lbs. of joint lead, some yarn, and a bucketful of stones were in front of it, it is surprising that the scraper came through at all. The rear piston disc, two knives, and one spiral and one longitudinal spring, were broken; and it cost £7 10s. to repair the damage before the second length of piping could be scraped.

The actual time taken to scrape the 14 miles of pipe was three hours for the first eight miles and three hours for the second section of 6 miles, or an average of 2⅓ miles per hour. There are seven scour-out valves on the 8-mile, and seven on the 6-mile section. These are left open after the scraper has passed until the water becomes clean. It is here that the time is lost, for in some cases this takes 20 minutes. A margin of time also has to be left between the opening of the next scour-out and the one which has been reached, as the leading men cannot be seen on any part of the line. It is found that the greater the velocity of the water passing through the pipes, the greater is the corrosion and incrustation, so long as scouring action is avoided. In the Torquay mains, the velocity of the water is rather high; being 3½ feet per second in the 10-inch length of the old main, and 4·32 feet per second in the 9-inch portion, while in the new main it is 4 feet per second.

An analysis of a sample of rust taken from the main in May showed that it contained iron to the extent of 49·03 per cent.; leaving 50·97 per cent. for matter deposited. This latter amount is composed of lime, organic matter, silica, carbonic acid, &c.; so it is easy to trace where the different constituents were obtained for building up the nodules. A portion of the carbon, sulphur, and silicon is no doubt obtained from the cast iron of the pipe; while the other portion is extracted from the solid matters carried in the water. The nodules of rust are made up of a series of layers; and these appear to increase in hardness the farther they are from the centre. The centre portion of the nodule is generally soft material, and when dry goes to a fine powder. The fact of there being a series of layers, suggests that they are built up periodically like the rings in the harder kinds of timber. This must be due to the variations of heat, magnetism, greater acidity of water at one time than another, or some organic impurity in the water. The oxygen extracted from the water must, we know, pass through the outer layers before it reaches the iron of the pipe; and the outer layer is always less oxidized than the inner. Whenever a nodule is cut off the pipe immediately after the water has been drawn off, the top layer will be found of a dark colour, while the inside will be the well-known brownish-red colour of iron rust. As soon, however, as the nodule has been taken away from the water and begins to dry, this dark layer changes by oxidation into the brownish-red colour of the interior.

The chemical action in the formation of rust is as follows.

The iron is first attacked by the carbonic acid and water, and this forms ferrous carbonate, thus—

$$(1)\ Fe_2 + 2CO_2 + 2H_2O = 2FeCO_3 + 2H_2.$$

The ferrous carbonate is then dissolved by the excess of carbonic acid in the same manner, as carbonate of lime is held in solution by chalk water. Ferrous carbonate, being a very unstable compound, is quickly oxidized by the oxygen in the water, and forms ferric oxide (Fe_2O_3) and carbonic acid gas, thus—

$$(2)\ 2FeCO_3 + O = Fe_2O_3 + 2CO_2.$$

It will therefore be seen that a similar amount of carbonic acid gas is given off in No. 2 as is used in No. 1; so it follows that a small quantity of carbonic acid suffices to keep up the reaction. Ferric oxide is not magnetic, but ferrous carbonate is; and no doubt this magnetism plays a very important part in the rusting of water-pipes.

The incrustation or deposit varies considerably in different districts. At Southampton, where the water is derived from wells sunk in the chalk, the coating is of pure calcium carbonate, which is very pretty to look at, and forms a desirable interior surface from one point of view, if not from the other of reduction of pipe area. At Bath, the water (which is an upland surface one) is obtained from the oolite and lias formations, and the deposit is composed of $CaCO_3$, $CaSO_4$, and Fe_2O_3. At Brighton, with water from the wells in the upper chalk, there is very little deposit or rust; while at Leicester, where it is obtained from an upland gathering-ground of slate rocks and red marls, they are compelled to scrape the mains. At Nelson and Burnley, the water is from the millstone grit; and both are upland supplies. In these cases the mains require scraping; and in the first, an accumulation of thirteen years' rust reduced the delivery of a trunk main from 1,120,000 to 811,000 gallons per day. At Stroud, with well water from the Mitford sands and blue lias, they are troubled with a deposit of lime.

Where well waters are derived from the old red sandstone formation, there is not, as a rule, much trouble with either incrustation or deposit; but water from the greensand causes rust in some cases. Speaking generally, it may be laid down with a fair approximation to the truth that well waters have not so great an action on pipes as those from upland gathering-grounds; but where the water is soft, the corrosive action will be greater. Filtered water has also less corrosive power than unfiltered.

The liability of cast iron, wrought iron, and steel to oxidize is as follows: Cast iron, 100; wrought iron, 129; steel, 133. All engineers who ever have to deal with soft upland water supplies should take these figures into careful consideration when designing their pipe-lines.

Whatever protective covering is applied to pipes, soft waters will cause rusting within a few years of being laid. At Torquay, six years is the outside limit when this commences; so every precaution is taken to see that the pipes are well coated. The alkalies, alkaline carbonates, and ammonia have a slight dissolvent action on Dr. Angus Smith's composition. The Torquay water is a trifle alkaline at times; while at others it is slightly of an acid character, probably due to peat. At the same time there is always a small amount of free ammonia present, and probably that is the reason of coated pipes rusting within such a comparatively short period.

In some pipe foundries it is to be regretted that those in charge do not study this subject of rusting sufficiently, and therefore fall into the error of supposing that a little preliminary rusting before the dipping takes place does not matter. For water from granite districts especially the question of rusting is paramount, and water engineers should insist upon the pipes being free from scale and rust before dipping. The method usually adopted in this country is to heat the pipes in an open cylindrical stove of brickwork at the bottom of which is a fire, and when the pipes have attained a heat of about 600° Fahr. they are dipped in composition near boiling-point. The pipes are left in this composition until they have acquired the temperature of the liquid, and are then taken out and allowed to cool while hanging. Any portion of the coating which is damaged while the pipes are being handled should be painted with a natural asphalte dissolved in bisulphate of carbon.

The following process has been recommended for steel pipes: During rolling it is found that the surface of the steel is changed into a magnetic oxide (black oxide), which resists corrosion but soon scales off. This scale should be removed by placing the pipes in a sulphuric acid bath, followed by one of lime water immediately before the plates are riveted up, and then dipped in nearly boiling asphaltic composition. The composition should be natural asphalte, containing a large proportion of bitumen, with just sufficient creosote oil added to make what is necessary to produce when cold a smooth, plastic, and strongly adhesive varnish.

Much has been done to get a satisfactory coating to pipes; but there is still considerable room for improvement, and it is hardly necessary to point out that a fortune awaits the man who can invent something that will withstand the action of soft waters.

In opening the discussion upon the paper, Mr. H. M. Brunel stated that he was present when the plan of scraping the main was first tried in 1866, and had advised upon the laying of the new main at Torquay, but had had nothing to do with the actual process of scraping, either in the case of the old main or the new one. He pointed out, however, that it was the incrustation of the original Torquay main which had led to a revision of our theories of the nature of hydraulic resistances. Mr. W. Froude had shown that it was the incrustation which caused the defect in the capacity of the pipe, and that the previously held opinion that the roughness did not very much matter was erroneous. Mr. G. F. Deacon said he did not think that the presence of gases in the water was really responsible for the corrosion of the main conveying it, but that acids were the cause of it. Soft water was generally found to be the most corrosive, from the fact that it was usually the most acid. The nodules referred to by Mr. Ingham were formed not only on cast-iron, but also on steel and wrought-iron pipes, in exactly the same way. Each nodule appearing in a coated pipe always covered a minute puncture in the coating; and to avoid this, he had adopted the practice of dipping a pipe twice on coating it. Nodules were, however, not the only cause of a diminution in the discharging capacity of a main. The so-called "peaty" deposit was also a source of trouble. It was not really peat, but oxide of iron and manganese; and was common when upland water was passed through cast-iron pipes. Two or three years ago, he was consulted in regard to a reduction in the capacity of the upper Vyrnwy main from the lake to the Oswestry filter-beds, a distance of 13 miles. The daily discharge had fallen from between 16 and 17 million gallons to between 12 and 13 millions. A thorough examination showed that the retardation could not be accounted for by nodules; but the peaty deposit was found in the scour-boxes. The material had been investigated by Dr. Campbell Brown and Professor Boys; and, though final conclusions had not yet been arrived at, it was shown that a bacterium was responsible for its production. As the Vyrnwy pipes had been very carefully coated, he did not like to have them scraped, but thought that possibly brushing them would prove effective. The brush used consisted of a shaft, on which was mounted a drum, nearly fitting the pipe, which served to drive the whole forward. Two other drums, each 2½ inches less in diameter than the pipe, were mounted on the same shaft, and armed with bristles of whalebone, arranged screw fashion, so that water going past tended to rotate the brushes. The water flowed at the rate of a mile an hour, and the brush moved forward at about one-third of this rate. Between the brush and the pipe the water therefore flowed at a much greater speed, and the brushes were thus efficiently rotated in opposite directions. With this appliance the whole distance to Oswestry was traversed, with the result that the discharge of the main was again brought up to its original standard. In his paper, the author had mentioned that the incrustation was less with filtered than with unfiltered water. This he (Mr. Deacon) could confirm. Filtration reduced the acidity of the water, and almost entirely prevented the production of the deposit to which he had referred. Mr. Charles Hawksley remarked that apparently the author had estimated the benefit of the scraping, and also the enlargement of the pipe due to corrosion, by comparing the actual discharge after scraping with that calculated by a particular formula. This seemed to him to be very unsatisfactory. With respect to the coating of pipes, this was unfortunately often done ineffectively; the pipes not being allowed to remain sufficiently long in the coating bath to acquire the proper temperature. With a view to preventing the oxidation of the pipes before coating, his late father had adopted the practice of having the pipes proved with oil in place of water. Mr. E. M. Eaton said the subject of the paper was one upon which he had had extensive practical experience at Sheffield. The water there, being obtained from the moorland, was very soft, and corrosive effects were most remarkable. When he first went to Sheffield, several miles of service-pipes were nearly choked, the free diameter being reduced to the thickness of a tobacco-pipe. To clean these 3-inch or 4-inch pipes, he had adopted ordinary spring flue scrapers, mounted at the end of ¾-inch gas tubing. With this a gang of four men could clean 100 feet of pipe each way in a single night; the cost for a 4-inch pipe being 10d. per yard run. This method had, however, to be abandoned in the residential districts of the town, as the loosened iron oxide and peaty matter caused constant complaints from consumers; but it was still used in the poorer districts. For larger mains, up to 12 inches in diameter, he used a scraper of the Glenfield model, and found it very satisfactory; from ½ to ¾ mile of 9 to 10 inch main being cleaned and closed up again in a single night. He was unable to agree with Mr. Deacon that the nodules arose from a fracture in the coating of the main, as he had examined hundreds of cases. In Sheffield, at all events, the nodules seemed to be laid down from iron in solution. Each tubercle, in fact, had a fragment of moss or peat as its centre, surrounding which was a very friable layer of iron oxide, followed by layers of harder oxide. He had found painting pipes to be more efficient in checking tubercular corrosion than the ordinary process of coating; but it was expensive. At the same time, he did not attach too much importance to this, as his experience was that, sooner or later, nodules would appear on even the most perfect of coatings. In replying to the discussion, Mr. Ingham remarked that much of the success of the process he had described was due to Mr. Weekes, his predecessor at Torquay. When it was first proposed, difficulty was expected in following the progress of the scraper; and, in consequence, the plan was adopted of fixing a cord to it. Speaking generally, he thought that all the experience at Torquay was on a line with

Mr. Deacon's observations. He had examined scores of tubercles, and always found the puncture referred to. In uncoated pipes, the nodules formed one sheet. With respect to the microbe solution of the problem, he thought there was something in it; and at Antwerp similar troubles had arisen from what appeared to be bacterial action. As to Mr. Hawksley's objection to the comparison of an actual with a calculated discharge, he might say that careful experiments made by Mr. Box had shown the latter to be very nearly correct in the case of the Torquay main. Mr. Eaton's price for pipe cleaning at Sheffield seemed very high, as at Kendal it was only 6½d. per yard run. The Glenfield scrapers referred to closely resembled those of Appold, to whom the original idea was due. He might remark that Mr. Sandeman had recently told him that scraping the Plymouth mains had increased the discharge by 36 to 37 per cent.

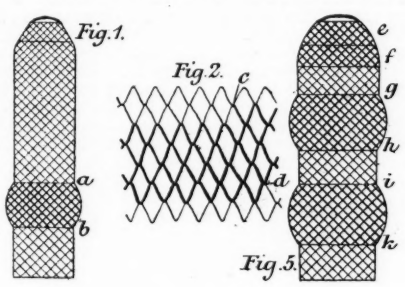
REGISTER OF PATENTS.

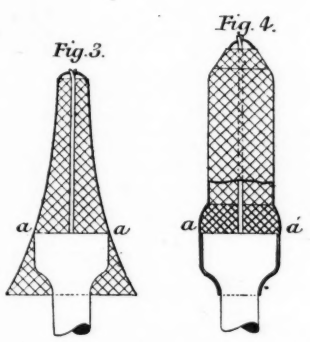
Incandescent Mantles.—Sieverts, W. H. A., of Hamburg. No. 26,254; Dec. 12, 1898.

This invention relates particularly to the strengthening of incandescence mantles, in the first place, where the bodies are liable to rub against the edge of the burner; secondly, at the upper edge—more especially upon the border of the edging of net frequently employed; and finally, in the middle of the mantle.

It is a common experience, the patentee remarks, that mantles become torn upon the edge of the burner, and also blackened, very shortly after they are first used. "This appearance is explained upon consideration of the fact that the incandescence bodies, as soon as they are lighted, become longer owing to expansion; while, when the flame is extinguished, they contract. The incandescence body thus moves downwards and upwards upon the ignition and extinction of the flame respectively. As, in addition to this, the incandescence body is also drawn inwards by the flame, and rubs against the burner, it soon wears away at its lower portion. This defect may be remedied by making the incandescence body of very much stronger or reinforced fabric at the place where it is liable to come in contact with the burner, or by impregnating it with a very strong liquid at that point."

A further defect pointed out by the patentee as inherent in incandescent bodies as hitherto made, is that they become sharply contracted or collapse after being in use a short time. "Owing to this deformation, the body soon loses its illuminating power to a marked extent, because the illuminating surface becomes smaller, and the incandescence body is no longer at the periphery of the flame. This defect is attributable to the suction caused by the flame; and it may be obviated by reinforcing the incandescence body between its summit and the crown of





the burner, by means of a strengthening strip of greater or less width parallel with the edge of the burner crown," in the manner already described. It is also advantageous to provide similar strengthening at the summit of the incandescence body—especially at the border of the net edging frequently employed. Owing to the provision of this reinforcement (the incandescence body will withstand the suction caused by the flame), it may be held away from the edge of the burner; and this is also the case when the lower portion of the incandescence body fits tightly around the burner, so that the rubbing and consequent wearing and blackening at the edge is rendered completely impossible. As, in consequence of the greater concentration of the impregnated mass, the body is not drawn in towards its centre, it also resists the suction of the flame at its upper portion. It is claimed that it therefore retains its original form for its entire length, and consequently also its full degree of luminosity.

Fig. 1 shows an incandescence mantle which, at the portion between *a* and *b*, where it comes into contact with the burner, is reinforced by meshes of material. Fig. 2 shows a portion of an incandescent body having reinforced meshes from *c* to *d*. Fig. 3 shows a mantle which, by the action of the flame, has been drawn inward, and which at *a* is in contact with the burner-head. Fig. 4 shows a mantle constructed according to this invention, and attached to a bunsen burner. Fig. 5 shows an incandescent body provided, according to this invention, with thick mesh at its upper portion *e f*, at its middle portion *g h*, and at the portion *i k* nearest the burner-head.

Strengthening Incandescent Gas-Mantles.—Blaasch, H., of Hamburg, No. 27,342; Dec. 27, 1898.

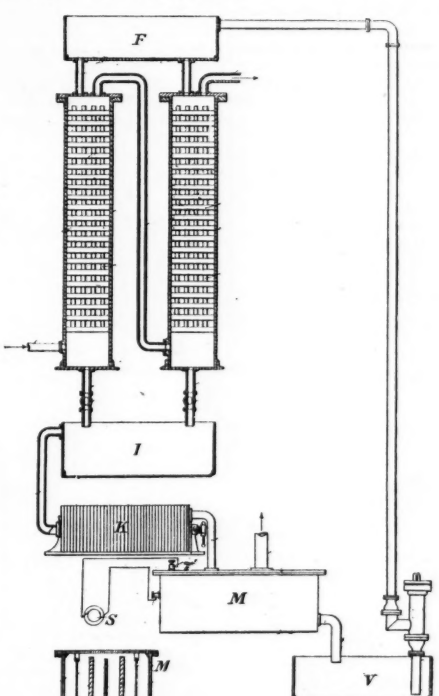
This process for rendering mantles for incandescent gas lighting more strong and durable, consists in suddenly cooling them, after they have been incinerized and formed on the gas-flame, and while in a glowing state. A suitable liquid for the purpose is distilled water; but there may also be used distilled water having a small percentage (say, 1 per cent.) of a soluble salt of one or more of the earth metals—such as cerium, lanthanum, neodymium, praseodymium, yttrium, thorium, beryllium, erbium, terbium, scandium, samarium, aluminium, or the earth alkali metal magnesium.

Purification of Coal Gas.—M'Dougall, A., of Fallowfield. No. 2502; Feb. 3, 1899.

This invention relating to the purification of coal gas, has for its object "to provide a continuous process for such purification, simultaneously with the recovery of certain bye-products and their utilization," by using certain solutions (which may be acidified or not) of the persalts of iron, manganese, or chromium, or of mixtures of solutions of these metals in wet scrubbers. On these solutions coming into contact with the foul coal gas in the scrubbers, chemical reactions ensue whereby free sulphur is precipitated, and simultaneously the persalt solutions are converted to protosalt solutions. The free sulphur can be removed from the liquid by settling or filtration.

The invention further consists in oxidizing the protosalt solutions to persalt solutions by electrolysis. When a suitable current is employed, reactions ensue, with the result that hydrogen is given off at the kathode, and at the anode the protosalt solutions are oxidized to persalt solutions, so that they may be again available for use—the process being continuous. The hydrogen evolved may be employed for lighting, heating, balloon, or motive power, or other purposes.

The condensing towers or scrubbers shown are fitted with cross boards, and are connected to the main from the retorts by inlet and outlet pipes; while the upper part of one tower is connected to the lower part of its adjacent tower by a central pipe. An overhead tank F, adapted to contain the persalt solution, is arranged to communicate with the top portion of each tower. The bottom of each tower communicates with a collecting-tank I, which in turn communicates with a filter-press K, and lower still with an electrolytic regenerating vat M.



This vat consists of a closed-in vessel divided by porous partitions into compartments adapted to contain the liquid to be regenerated. The inner compartment contains the anode, which may consist of a number of plates of platinized carbon or thin sheets of platinum or other suitable material; while the outer compartments contain the kathodes which consist of sheets of lead or other suitable material. The current for the vat is furnished by a continuous-current dynamo S; and the vat itself is fitted with a pipe by means of which the liquid may be drawn off into a tank V, and a pump for returning the regenerated liquid to the overhead tank.

The operation of the apparatus is as follows: The tank F is filled with a solution (which may be acidified or not) of a persalt of iron, manganese, or chromium—for example, ferric chloride or ferric sulphate. The liquid flows down through the scrubbers or condensers, where it meets the stream of foul gas which passes into the scrubbers by the inlet-pipe at

the lower end. Owing to the action of the sulphur compounds in the gas, the ferric chloride or sulphate solution becomes converted into a solution of the corresponding protosalt or ferrous salt, with precipitation of sulphur. The protosalt solution, carrying with it the sulphur thus formed, passes into the collecting-tank I. Part of the sulphur may be recovered by settling in this tank, but the greater part is recovered from the filter-press K, through which the protosalt solution passes on its way to the vat. The protosalt solution in the vat under the action of the electric current is oxidized to persalt solution at the anode, with evolution of hydrogen at the kathodes. The hydrogen passes off into the electrolytic vat, and may be collected and mixed with air and a proportion of ordinary coal gas to provide the motive power of a gas-engine, which may be employed to drive the dynamo. The regenerated persalt solution which is formed in the vat is drawn off into the collecting-tank V, from which it is pumped into the overhead tank F, to be utilized again in purifying the gas.

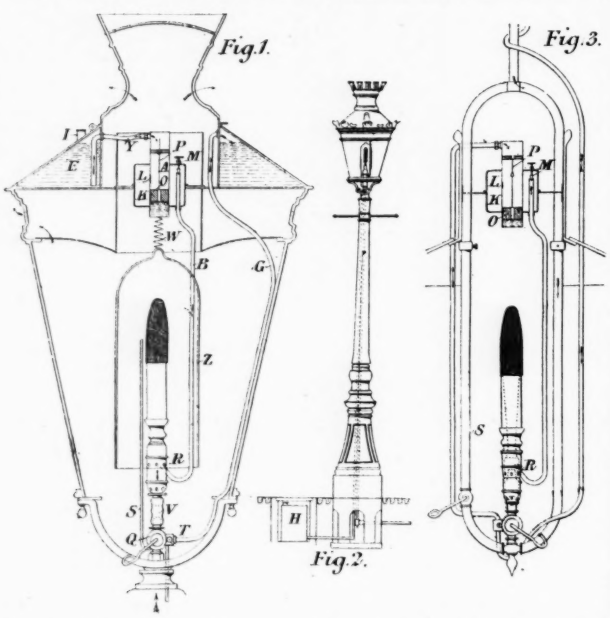
Burning Acetylene Gas.—Wigham, J. R., of Dublin. No. 4365; Feb. 28, 1899.

One of the objections to acetylene as heretofore used, the patentee remarks, is that it "has always been necessary either to burn it at full cock or to turn it out altogether, inasmuch as when turned down so as to reduce the consumption and make a small flame which can be turned up again in a moment, carbon is deposited on the jet, causing smoke and unpleasant smell, and interfering with the proper consumption of the gas when turned up again." His invention, therefore, consists "in attaching to each acetylene burner, of whatever kind or shape it may be, a high-pressure needle-hole jet as a stand-by, fed by the gas at the full pressure of the gasholder; the flow of gas when burning being not interrupted by the intervention of any valve or tap." The gas through this jet enters the air with such velocity as to ensure perfect combustion, and prevent the deposit of carbon; and at the same time the needle-hole jet, being fed at high pressure, resists extinction by currents of air. Thus the ordinary burner may be turned off, leaving this small stand-by jet alight; so that, in order to relight the gas, it is only necessary to turn on the ordinary tap, when the gas will be ignited by the stand-by.

Incandescent Gas Lighting and Heating.—Greyson de Schodt, P., of Namur, Belgium. No. 13,674; July 1, 1899.

This invention relates to a method of obtaining flames of "a high thermic degree" by the injection of superheated steam; the result of the injection being, in the first place, to increase the suction of the air, and secondly to impart to the mixture "the active force requisite for energetic combustion, and finally to obtain the decomposition of the steam beneath the mantle in the presence of carbon. This decomposition gives rise to the production of hydrogen, and of oxide of carbon, which combine with the air in developing a very high temperature."

The invention is said to be applicable to public or street lighting, and also for private or domestic lighting and heating. For the former, in the upper portion of an ordinary street-lamp (fig. 1) is arranged a small boiler, consisting of a boiler-tube A and a vessel K; the two reservoirs being in communication by means of an aperture L. Within the boiler-tube is provided a float O, the rod of which is formed by a needle-rod P, which closes the passage for the feed-water immediately the water-level of the boiler is reached. The boiler is supplied with water by means of



water under pressure, which enters the boiler through the tube Y, which is immersed in the circular reservoir E. This reservoir, which may be filled with water through the aperture I, is in communication, by means of the pipe G, with the reservoir of compressed air H (fig. 2). The pressure of air in this reservoir is obtained by means of a hand-pump, or in any other suitable manner. When the burner is lighted, the small quantity of water contained in the boiler A becomes rapidly vaporized; the steam produced passes into the vessel K; and thence through the tube B into the burner—issuing therefrom through the curved outlet R. An adjusting screw M is adapted to regulate the passage of the steam.

The burner employed is one of the kind which consists of a "parabolic mixing suction-device," surmounted by the burner proper, having the form of an inverted truncated cone as employed for intensive illumination. The admission of the gas takes place through a two-way cock Q, enabling ignition to be effected by means of the row of perforations in the pipe S. The cock is provided with a wheel gearing with a pinion, which displaces the air-cock T in such a manner that when ignition occurs the boiler is supplied, while when the lamp is extinguished the supply ceases. A piece of india-rubber tubing V, and a spring W, isolates the burner, which is supported by the lyre Z, from all vibration.

Under the influence of the air pressure introduced into the reservoir E through the tube G immediately the cocks Q and T are opened, water is able to penetrate, by the pipe Y, into the boiler A. When a certain quantity of water has entered the boiler, the float O rises and closes the passage for the admission of water by means of the needle-rod P. As during this time the burner has been ignited by means of the perforation in the pipe S, the heat of the products of combustion will have vaporized the water, and the steam will escape through L, and enter the feed-water heater K. From there, the superheated vapours pass into the pipe B, which conducts them beneath the burner. They carry with them there a certain quantity of air, which enters into the mixture in such a manner that (when this latter reaches the point of combustion) each gaseous element is accompanied by elements of air saturated with the vapour. "At the moment when combustion takes place, the carbon of the hydrocarbon contained in the gas is liberated; and in the presence of the steam, water gas is formed in proportion as the combustion takes place." It follows from this that the added steam serves, not only as a conveyor of air, but more particularly as a powerful agent for the production of high temperatures.

For the purpose of private illumination (see fig. 3), water obtained from an ordinary water supply will be most frequently employed—being conducted to the boiler by means of a fine flexible tube. The arrangement does not differ appreciably from that for public illumination; and the operation is similar.

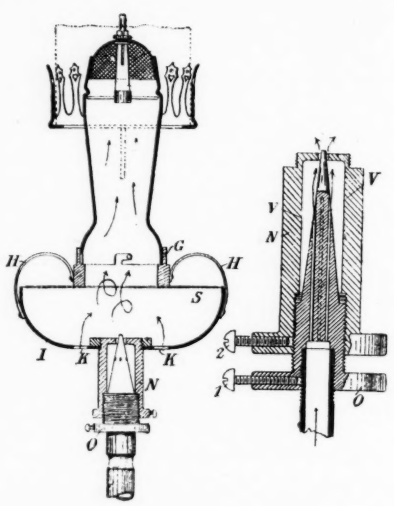
Gas Lamps and Lanterns.—Shaw, E. J., of Walsall. No. 14,948; July 20, 1899.

This "invention" relates (1) to the provision, in gas lamps or lanterns, the burners of which are fitted with bye-passes, of a rotatable valve, by means of which gas may be caused to pass (*a*) to all burners in the lamp, (*b*) to any one or one set only of burners, or (*c*) to feed only the bye-passes to all the burners—the valve in all three positions allowing gas to flow to the various bye-passes; and (2), in the globes of gas lamps and lanterns, the use of a ball or sphere of glass or other suitable material normally located in a seat in the lowermost portion of the globe (where a hole is made for the lighting torch), and acting as an automatically closing device.

Incandescent Gas-Burner.—Murinick, A., of St. Petersburg. No. 20,423; Oct. 11, 1899.

This invention relates to a pressure-regulating and anti-shock arrangement of incandescent gas-burner, as shown in the engraving—a longitudinal section and the inlet-nozzle on a larger scale.

The body of the burner (preferably of the shape shown) is attached by means of bayonet catches, or in any other convenient manner, to a ring G, provided below with a perforated plate S, and connected at several points to a metal dish I by means of springs H. The dish has several air-holes K; and a support N is screwed on and made fast to the dish, so that the nozzle O can be screwed into it. The nozzle has in it several vertical apertures V, through which the gas escapes. The closed end of it can be screwed into or out of the circular aperture P at the top, so that its free area can be made larger or smaller as desired.



In consequence of the gas escaping vertically through the holes V, says the patentee, the gas current maintains its maximum force, as it is nowhere checked. It has, moreover, the advantage that, as the gas escapes in the form of a ring, the inner and outer surfaces of the hollow cylinder of gas thus formed have considerable chance of mingling with the surrounding atmosphere.

The method of operation of the device is as follows: If, for instance, the gas pressure is very great, the screw 2 is loosened, and the support N screwed down. The aperture P thus becomes smaller, and the escape of gas diminishes. This adjustment of the nozzle can be fixed by the screw so that the flame burns uniformly. If, on the contrary, the pressure of gas is too low, the support N is screwed upwards, and the aperture P becomes larger. It should be noted, the inventor remarks in conclusion, that after the exit of the gas through the aperture, there is a primary intimate mingling with air in the dish I, which is further considerably

augmented in the lower part of the body of the burner. The mixture then (as indicated by the arrows) arrives together at the incandescent mantle.

APPLICATIONS FOR LETTERS PATENT.

23.—Edmundson, J. W., "Production of artificial light for street lamps and ordinary illumination." Jan. 1.
28.—Johnston, A. J., "Gas-tap." Jan. 1.
67.—Millar, F. J. M., "Cooking and heating stoves." Jan. 1.
74.—Richmond, E. W. T., Thornton, H. M., and Richmond and Co., Ltd., "Gas-fires." Jan. 1
92.—Howard, A. H., "Pipes." Jan. 2.
100.—Hounsell, B. W., "Regulating the supply of gas." Jan. 2.
109.—Barker, R. W., "Gas-stoves." A communication from V. W. Blanchard, and E. K. Stow. Jan. 2.
131.—Craven, R. E. P., "Fluid pressure regulating valves." Jan. 2.
133.—Lake, H. H., "Time-indicating meters." A communication from G. Pedrazzini. Jan. 2.
179.—Mayrisch, E., "Gas purifying apparatus." Jan. 3.
194.—Lancaster, E. W., "Purifying acetylene gas." Jan. 3.
234-5.—Snell, C. S., "Compressing or intensifying gas." Jan. 4.
250.—Engelke, W., and Meyer, F., "Dry gas-meters." Jan. 4.
296.—Burnett, J., "Controlling the supply of gas to burners." Jan 5.
334.—Chandler, S., jun., & J., and Kirkham, Hulett, and Chandler, Ltd., "Gas-governors." Jan. 5.
352.—Piatt, A. D., "Acetylene-lamp." Jan. 6.
366.—Lieske, M., "Acetylene gas generator." Jan. 6.
367.—Crankshaw, M. A. & H., "Gas-shades." Jan. 6.
388.—Earl, S. J., "Acetylene generators." Jan. 6.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1900).

Opposition on Standing Orders.

Last Tuesday was the final day for depositing at the Private Bill Office of the House of Commons, memorials complaining of non-compliance with Standing Orders in the case of the first hundred Bills in the General List of Petitions. On that day, memorials had been received in regard to the petitions for the London Water (Welsh Supply) Bill, the South Essex Water Bill, and the South Essex Water Board Bill. In the case of the first-named Bill, the memorial was deposited on behalf of John Griffiths, the proprietor of an establishment consisting of a pump-house, hotel, and grounds situated in the parish of Swarafog, Breconshire. The memorials in respect of the South Essex Water Bill were from the Barking Urban District Council, the Rural District Councils of Ossett and Romford, and from Grays Thurrock and Ilford. In the case of the South Essex Water Board Bill, the memorialists were private parties.

The following Bills, the petitions for which are among the first hundred, will not be opposed upon Standing Orders: Aberdeen Police and Improvements Bill, Bedford Gas Bill, Bradford Corporation Bill, Cambridge Corporation Bill, Chelsea Water Bill, City of London (Various Powers) Bill, East London Water Bill, East Stirlingshire Water Bill, Exmouth and District Water Bill, Glastonbury and Street Gas Bill, Glastonbury Corporation Gas Bill, Grantham Gas Bill, Great Berkhampstead Water Bill, Halifax Corporation Bill, Hastings Corporation Bill, Higham Ferrers Water Bill, Ilfracombe Improvement Bill, London Water (Purchase of Companies) Bill, Margate Corporation Bill, Morecambe Urban District Council (Gas) Bill, North Warwickshire Water Bill, Oldham Corporation Bill, Ossett Corporation Gas Bill, Ossett Gas Bill, Redhill Gas Bill, Rotherham Corporation Bill, St. Albans Water-Works Company Bill, Southport Extension and Tramways Bill, Walsall Corporation Bill, Westgate and Birchington Water Bill.

Prospective Extensions at the Carlisle Gas-Works.—The Gas Committee of Carlisle and their Engineer (Mr. C. B. Newton) have under consideration the question of extending the gas-works. During the last few weeks, there has been more gas sent out from the works than during any previous similar period; and the works are really now inadequate to supply the demand. It is understood that the ultimate cost of the extension will be something like £96,000; but the expenditure at present contemplated is about £32,000 or £33,000. A report by Mr. Newton is to be circulated among the members of the Gas Committee, who will hold a special meeting to consider it.

"Electroid" Gas Condemned as Dangerous.—A short time ago, a great deal was made in the papers of an installation of "electroid" gas at Hunmanby, near Filey, by the Electroid Gas Lighting Syndicate. The installation has recently been brought under the notice of the Chief Inspector of Explosives, who has investigated the matter with the aid of skilled advice. His opinion has been expressed in a communication addressed to Mr. Charles Gray, Clerk to the Bridlington Rural District Council. It is to the effect that "any system involving the admixture of air with acetylene gas is attended with very grave danger to the public." The letter goes on to state that in the present instance the apparatus and system of using it are attended with danger, and the writer suggests "that a warning should be issued to the licensees to the effect that the licence will be revoked or will not be renewed (according to the terms in which the licence was granted)." The Inspector of Explosives, it is stated, proposes to advise the Secretary of State to take the steps necessary for the issuing of an Order in Council prohibiting the mixing of acetylene with air or oxygen in the same way as the compressing of acetylene has been prohibited. The Clerk to the Council has been instructed by the Executive Committee to reply to the letter, and point out that the Council did not employ an expert prior to granting the licence, but that they were assured by the promoters of the scheme that there was not the slightest reason to apprehend any danger if a licence was granted.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Jan. 12.

(*Before Mr. Justice* Byrne.)

Welsbach Incandescent Gas-Light Company, Limited, v. New Sunlight Incandescent Company, Limited.

This action, which is brought for infringement of the plaintiffs' patent of 1893, which covers the manufacture of mantles made of thorium with a small proportion of cerium, came before the Court on a summons by the defendants for leave to administer interrogatories to Mr. Moeller, Mr. De Fonblanque, and Mr. Mackean, as officers or members of the plaintiff Company.

Mr. Bousfield, Q.C., and Mr. Neill appeared for the defendants; Mr. Moulton, Q.C., Mr. Terrell, Q.C., and Mr. Walter for the plaintiffs.

It appeared from Mr. Bousfield's statement that the defendants, by their objections, alleged that the patent in question, which was taken out by Mr. Imray as a communication from Mr. Moeller, who was then abroad, was anticipated by the former Welsbach Company, the predecessors of the present plaintiffs, by the use by them of a fluid for impregnating mantles, sent to them by Dr. Welsbach, which was substantially of the same composition as that claimed in the patent. They therefore desired to administer interrogatories to the gentlemen named, with the view of discovering the facts. The arguments occupied a long time; Mr. Moulton and Mr. Terrell contending that the interrogatories ought not to be administered at all, inasmuch as they referred to matters alleged to have occurred before the plaintiff Company came into existence, and which therefore could not be within the knowledge of any members or officers of the Company as such, and that the Company were not bound, even if the Secretary were interrogated (which was the usual practice), to obtain information from any present officers or members as to matters which happened before the Company was formed.

Justice Byrne, in giving judgment, said he did not think it was right to administer the interrogatories to the gentlemen named, simply because they might, *aliunde* their present connection with the Company, have acquired certain information. At the same time, he thought some of the interrogatories might fairly be administered to the Secretary of the Company; and he gave leave so to do, but without prejudice to his taking any objections he might be advised as to answering.

Mr. Bousfield asked leave to appeal.

This was granted, on condition that notice was given at once, so that it might come on in the present week, or on the earliest day the Court of Appeal were taking interlocutory business.

The Traffic in Infringing Incandescent Mantles.

At the Westminster Police Court on Monday last week, before Mr. Francis, David Felix, a hairdresser's assistant, was charged with assaulting Sidney Albert, of Percy Street, Tottenham Court Road, at 1, Dartrey Terrace, Chelsea, on the previous afternoon. Mr. P. Conway appeared for the prosecutor; and Mr. F. Hill defended. Prosecutor, who described himself as a traveller in incandescent mantles, stated that on the 5th and 6th inst. he saw a Mr. Barnard, who had a barber's shop at 1, Dartrey Terrace, Chelsea, with respect to a "little matter of business." Barnard was the prisoner's employer. In pursuance of an appointment made as to the sale of some "stuff," witness again went to the barber's shop at three o'clock on the Sunday afternoon, and was admitted the private way—the door of the shop being closed. When witness was inside, Barnard locked the doors. Prisoner was present, as also were a Mr. Solly Benjamin and another gentleman. There was a conversation about incandescent mantles; and then all the men present attacked witness. The Prisoner struck him a blow on the left temple; Benjamin hit him over the top of his head, breaking his hat in several places; and the unknown gentleman remarked that he had a "six shooter" in his pocket which he intended to use. He (Albert) rushed about to escape, and screamed as the prisoner pushed his head through the glass panel of a door. In this position his cries attracted the attention of the police, who came to his assistance, and obtained access to the premises by unlocking the door from the inside, through the broken glass. Cross-examined by Mr. Hill, prosecutor said the "little matter of business" he had on hand was the sale of infringing Welsbach mantles. Mr. Barnard also dealt in mantles. He (prosecutor) admitted that he was trying to do business in infringing mantles, which came from Rotterdam; but he would not acknowledge that it was in consequence of his trying to foist these articles on Mr. Barnard that he was ordered to leave the premises. A policeman stated that his attention was attracted by the smashing of glass, and he saw prosecutor's head and chest through the glass panel—the prosecutor being punched by the prisoner. For the defence, Mr. Barnard said the prosecutor persistently called at the shop, trying to sell infringing mantles at 2s. 6d. a dozen. On the Sunday afternoon in question, Albert was ordered out of the place, and was finally ejected by the accused. The glass window was broken by the prosecutor using his elbow. After other witnesses had given evidence, Mr. Francis said prosecutor had no marks of serious assault, and he had evidently gone to the shop on a peculiar errand. He (the Magistrate) believed Albert was ordered out of the place. He discharged the accused.

Committal for Stealing Gas.

At the Lambeth Police Court, on the 6th inst., Thomas Whitley, a print colourer, of Teather Street, Camberwell, was charged with stealing a quantity of gas, value 3s., the property of the South Metropolitan Gas Company. Mr. Passmore prosecuted; Mr. W. H. Armstrong defended. For about two years the prisoner had been a customer of the Company; the gas with which he was supplied passing through a "slot" meter. On visiting the prisoner's premises, for the purpose of removing the money, Mr. Bryant, a collector in the employ of the Company, noticed that the meter was loose. This led to an examination, and it was found that an arrangement had been made, by the insertion of a small piece of

piping, whereby the gas could be carried from the main into the service-pipe of the house without passing through the meter. When seen by by Mr. M'Leod, one of the Company's inspectors, the prisoner assured him that nothing of the sort had happened prior to the 21st of December; and on the way to the station the accused admitted that he had been very foolish. In addressing the Court in mitigation of punishment, Mr. Armstrong asked the Magistrate (Mr. Hopkins) to take a lenient view of the case. The prisoner had been a week in prison, and had never before had a charge of any sort or kind brought against him. Mr. Passmore, for the Company, said the offence of which the accused was charged was a very prevalent one, but it was difficult of detection, because those who resorted to it were careful, by the time the visit of the inspector became due, to remove all trace of any improper connection. Mr. Hopkins remarked that, as the Solicitor for the Company had said, the offence was difficult to detect; and when a man was fairly caught committing it he must take the consequences. The prisoner would have to go to prison for two months.

Embezzling Moneys of the Incandescent Gas-Light Company.

At the Brighton Quarter Sessions on Monday last week, George Henry Whiston, traveller, was indicted for feloniously embezzling moneys received by him on behalf of his employers, the Welsbach Incandescent Gas-Light Company, Limited, at Brighton. Prisoner pleaded guilty to having taken the money, but said it was not with any felonious intent. Mr. Day, who prosecuted, said the accused travelled for the above-named Company, but had failed to account for different sums received on their behalf. At prisoner's request, two cheques were made out to him, and he cashed these. He also endorsed a third, which was cashed for him. The prosecutors had no wish to press the case. Mr. E. E. Humphreys, in defending, asked for leniency on the ground that his client was in straitened circumstances. Out of his salary of £1 per week and 15 per cent. commission, he had to pay travelling expenses and keep a wife and two children. Prisoner's home was sold up, but his friends were prepared to repay the money. Prisoner, who received a good character, was sentenced to three months imprisonment, with hard labour.

Charge of Stealing Electricity.

The calendar at the County of London Sessions last week contained the name of Alfred John Harrison, who was accused by the Hammersmith Vestry of having stolen electricity by diverting in a skilful way the current from the cable supplying his house by a contrivance of his own, so that it did not pass through the meter. In addressing the Grand Jury, the Chairman (Mr. W. R. M'Connell, Q.C.) told them that such a device, improperly fitted up, amounted to the stealing of electricity in the same way that an unauthorized connection with a gas-pipe before it reached the meter meant theft of gas. After careful consideration, the Grand Jury returned "No bill." Mr. Bodkin, who had been instructed to prosecute, asked if all the witnesses had been called before the Jury came to a conclusion. Mr. J. Dix, Deputy-Clerk of the Peace, replied in the affirmative. Mr. Bodkin asked if they also had a certain letter written by defendant read to them. The two Jurymen presenting the bill replied that the contents of the document referred to were made known to them. His Lordship thereupon dismissed the witnesses for the prosecution from further attendance, and the defendant was informed that he need not wait to surrender.

Relaying Paving-Stones after Gas Connections.

At the Edmonton County Court last Tuesday, before his Honour Judge Paterson, the Tottenham and Edmonton Gas Company were sued on behalf of Zelia Maud Tuck, a little girl who sustained injuries in September last by tripping over a paving-stone, for £50 damages. It was stated that the stone had been improperly relaid by the Company's men after making a connection, and was $\frac{3}{4}$ inch above the level. Plaintiff was carrying some panes of glass, and when she fell they were broken, and she was severely cut. Witnesses were called who stated that the stone was dangerous to pedestrians. The Company denied responsibility. The men who relaid the stone said it was level when they left it two days before the accident; and a witness who saw the girl lying on the pavement said she was some distance from the stone, which was only $\frac{1}{8}$ inch out of the level. Mr. A. E. Broadberry, the Company's Engineer, stated that he had found stones as much as $\frac{3}{4}$ and $\frac{5}{8}$ inch out; and Mr. James Randall, the Secretary, and Colonel Murphy, the Surveyor to the District Council, mentioned that the Council's practice was to reset the stones after the Company's men had taken them up. The latter witness testified that the stones were not badly laid by the Company. The Jury returned a verdict for the plaintiff for £30 damages and costs.

Sales of Shares.—Messrs. T. Edwards and Sons, of Newcastle, recently sold £5000 of consolidated stock of the Staffordshire Potteries Water Company, at prices ranging from £180 to £200 per £100 of stock. Some £8 shares (£6 10s. paid) in the Dartmouth Gas Company were lately sold at prices ranging from £13 10s. to £14 each.

East Preston and the Littlehampton Gas Company's Provisional Order.—On Monday last week the East Preston Parish Council met to consider the Littlehampton Gas Company's proposed application to the Board of Trade for a Provisional Order to construct additional storage works, extend their limits of supply, and raise further capital. The following resolutions were passed: (1) That in no part of this small parish is there a sufficient number of houses to make it worth the while of the Company to bring gas so far from their works at present, nor is it likely to be the case for several years to come; (2) that the highways cannot be successfully lighted; (3) that, after inquiry among a number of ratepayers, no one desires to have gas except the tenant of the village inn. In view, therefore, of the probable improvement in the manufacture of water gas and the cheapening of electricity, it is not right that the parish should pledge itself to any scheme which might restrict the power of adopting any better or cheaper method of obtaining light in the future. The Council submit that the parish of East Preston should not be included in the area of supply.

MISCELLANEOUS NEWS.

THE MARKET FOR SULPHATE OF AMMONIA LAST YEAR.

Messrs. Bradbury and Hirsch, of Liverpool, have sent out their "Review of the Market for Sulphate of Ammonia during 1899."

Messrs. Bradbury and Hirsch open their report with expressions of congratulation on the prosperous working of the past year. They say that twelve months ago they looked for an improvement upon 1898, though that year showed a very substantial advance upon 1897 and 1896; but neither they nor anyone else anticipated at the time that the average price for 1899 would exceed that for 1898 by £1 16s. 2½d. per ton—the result actually achieved. They discuss later on the causes which have operated in the direction of the desired end. Here they simply say that the average price for the year is the highest since 1894; and express the hope that 1900 may prove to be at least equally satisfactory. So far as can be seen, the position seems to be pretty well assured, at any rate for some time to come; and they trust that when they write their next "Review" the war cloud which now claims the anxious interest of all British subjects may have long since passed away. They go on to say that the general trade of the country has not been so prosperous for more than a quarter-of-a-century as it is now; and there are no indications of decline in the near future. On the contrary, in many departments work is so far in arrear that sustained activity throughout 1900 may with some confidence be predicted, though dear money will doubtless tend to cripple unhealthy enterprise. A famous English statesman once advised his countrymen to "keep their eye on chemicals." There has been a "boom" in chemicals. But in this country the coal and iron and kindred industries are probably a better index of general prosperity; and in these trades there has been extraordinary activity. What is true of British industries is true of those of all the more progressive nations; for, in these days of quick and cheap transit, immediately the tide of prosperity or the pinch of adversity is felt in one quarter of the world, it begins to react upon all the rest. Having regard then to the condition of the trade of the world, as well as to that of the United Kingdom, and to the improved position of the farming interest, there seems to be every prospect of another prosperous year. In their last "Review," Messrs. Bradbury and Hirsch pointed out that, owing to a combination of circumstances, manure manufacturers covered the bulk of their 1899 requirements in mineral phosphates during the spring and summer months of 1898, at, to commence with, the low level of prices previously current, and subsequently at a moderate advance; so that they entered upon the 1899 season in a very favourable position. In 1898, manure manufacturers were able to advance their prices for superphosphates; and in 1899 they scored a further advance of 2s. 6d. to 5s. per ton, according to grade, but even that is scarcely adequate in view of the increased cost of materials. No doubt the high price of sulphate of ammonia in relation to nitrate of soda deterred them from purchasing this material for forward delivery to any large extent; and although they are not likely to get in at the level some of them anticipate, they can perhaps hardly be blamed for taking the chance. In other respects they have mostly bought well; and, if the demand for manures should come up to expectations, the season should be a profitable one.

With regard to nitrate of soda, Messrs. Bradbury and Hirsch say the history of this trade was uneventful throughout 1899; but in one respect they think it is now in a healthier condition than it has been for some years past. The production in 1899 was barely equal to the quantity shipped; and with past experience in their mind, producers will probably not be in too much haste to upset the balance of supply and demand now that it is in the way of being adjusted.

In their last "Review," the authors suggested that although the visible supply appeared to be ample, the quantity in the interior on the Continent was much reduced, and that consequently if the season came early, there was certain to be a squeeze before the end of April—there not being, in visible supply, room for an increase in consumption on anything like the scale of that of January-April, 1898. The season, however, came late, and notwithstanding the reduced stocks in the interior on the Continent when the year commenced, deliveries from the ports, Continental and United Kingdom, only exceeded those for January-April, 1898, by 30,000 tons, while the actual consumption over that period was probably 20,000 to 30,000 tons less. But cargoes were making long passages; so that stocks at the ports at the end of April were reduced to 50,000 tons, and at intervals, both in March and April, they were almost exhausted. During the two following months the demand was heavy, and deliveries exceeded those for May-June, 1898, by 45,000 tons—that is, by about 33 per cent.; so that deliveries over the six months exceeded those for January-June, 1898, by nearly 10 per cent. The visible supply (stock and afloat) at the end of 1899 was about 728,000 tons; at the end of 1898, 706,000 tons; and at the end of 1897, 645,000 tons. The visible supply was 68,000 tons in excess of the actual deliveries January-April, 1899, which were 660,000 tons. But deliveries after April were unusually heavy, owing to the lateness of the season; and so late a season cannot be counted upon safely in the coming spring. Had last year's spring season been early, it is probable that at least 30,000 to 40,000 tons more nitrate of soda would have been required by the end of April; and the authors think it will be prudent to take 700,000 tons and not 660,000 tons as a basis in estimating the probable requirements of Europe for January-April, 1900. If this is done, it will be seen that there is only a surplus of 28,000 tons. To this must be added shipments in January by steam and sail which may arrive before the end of April; but, on the other hand, losses at sea and late arrivals must be deducted. They calculate, therefore, that the margin will not exceed 50,000 tons; and, given an early season, they think this may prove to be dangerously small. Present prices, therefore, seem to be amply justified, and some further advance not at all improbable. Moreover, they think importers and dealers may consider a firmer attitude justifiable; and this would, of course, tend to harden prices. Even at a substantial advance on the present level, nitrate of soda would still be the cheapest source of nitrogen.

Coming to sulphate of ammonia, Messrs. Bradbury and Hirsch say that, on the surface, the position at the end of 1898 corresponded rather

closely with that at the end of 1897; and it was argued that the collapse in prices which occurred in the spring of 1898 was bound to repeat itself in 1899. But, as they pointed out, closer scrutiny disclosed differences sufficiently important to justify the opinion that prices would be maintained and probably improved. There was in February a set-back from the advance achieved in January, occasioned by the lateness of the season and consequent postponement of Continental buying; but heavy shipments to Spain saved the situation, and from the end of February up to the end of April there was a steady advance in values, in spite of the persistent efforts of "Bear" operators to depress the market. The "Bear" element was quite out in its reckoning; but, by selling ahead at a discount on spot values, the natural advance in spot prices was retarded. Consumers, however, gauged the situation correctly for the most part, and bought steadily until towards the end of April, when, supplies becoming restricted, the speculative game was abandoned, and within a month prices had advanced about 35s. per ton. In May, large speculative purchases were made for July-December delivery at up to £12 7s. 6d. per ton f.o.b. Leith; and this proved to be the highest point reached during the year in the forward position. In June, there was a reaction from the feverish heat in May; and, undisturbed by speculation, the market pursued a normal course—prices gradually declining right on to the end of July. August was entered upon with minimum production and increasing demand; and there was a recovery of about 6s. 3d. per ton in values. In September, however, speculation again made its prejudicial influence felt—at first cautiously, but later, when the Beckton price was dropped for October-December delivery, with such boldness that eventually the confidence of foreign buyers was upset, and sales at any reasonable price became extremely difficult. Taking their cue from London makers, who, in October, repeatedly dropped their price for delivery up to the end of the year, "Bears" went "one better" all the time, and made large sales for delivery up to and including spring months. They pursued the same line up to the middle of November, in the absence of any further concession from makers. The spot price had declined from £12 5s. per ton at the end of August to £10 7s. 6d. per ton at the middle of November; and sales were reported to have been made abroad in the forward position in November at the equivalent of £10 12s. 6d. per ton f.o.b., though makers refused to sell below £11 per ton, or the equivalent, f.o.b. Two otherwise insignificant purchases for January-March delivery—one at £10 15s., and the other at £10 16s. 3d. per ton, Beckton terms—about the 14th of November, constituted the turning-point; and at once the whole aspect of the market was changed. Onward to the middle of December there was a scramble for supplies; the market advancing £1 per ton from the lowest point. Within the same period, there was large buying in the forward position up to September; and up to £11 15s. per ton was repeatedly paid, f.o.b. Leith, for January-June delivery. Beckton price meantime advanced to £11 10s. per ton, at which figure considerable sales were made for January-March delivery. At this point forward speculative buying ceased, and it was not afterwards resumed, although at the close makers would have accepted lower prices. During the second half of December, the spot market also drooped, owing largely to severe weather and interruption of inland transit on the Continent; and the closing quotation, f.o.b. Hull, was £11 per ton. The average price for the year was £11 5s. 9¾d. per ton f.o.b. Hull, against £9 9s. 7½d. per ton in 1898, and £7 18s. 4¾d. per ton in 1897. The past year's working was therefore highly prosperous; and although at the outset the situation was promising, nothing like the result actually achieved was anywhere anticipated. And if the average prices of nitrate of soda at Liverpool—£7 19s. 7d. per ton in 1899, £7 11s. 3d. per ton in 1898, and £7 15s. 5d. per ton in 1897—be taken as a basis of comparison, it will be observed that the average price of sulphate of ammonia in 1899 stands out in a still more satisfactory light; and it will be interesting to inquire to what causes it must be attributed, and to what extent the same or other forces may be reckoned upon in the coming year's business. Messrs. Bradbury and Hirsch attribute it, in the first place, to the policy of makers, adopted in 1897 and since persisted in, in disposing of their output as it has become available, or beforehand, and keeping their bins clear—thus rendering it impossible for speculation to obtain the upper hand; in the next place, to the absence of any important increase in production; and perhaps most of all to the remarkable increase in Spanish and Colonial consumption, apart from which it is doubtful whether prices could have been maintained even at the opening level. The importance of this increased consumption will only be appreciated when the further marked shrinkage in demand from all nitrate of soda consuming countries, the United States excepted, is taken into account. Nitrate of soda has been much the cheaper article per unit; and it has, of course, been used in place of sulphate of ammonia where it could be substituted to advantage, as it always will be under like circumstances. In their "Review" for 1898, Messrs. Bradbury and Hirsch tabulated the exports to the principal nitrate of soda consuming countries for three years; they now give the figures over a longer period, and add similar particulars of shipments to the other importing countries. The totals are as follows: In 1894, 103,338 tons; in 1895, 111,700 tons; in 1896, 126,025 tons; in 1897, 152,981 tons; in 1898, 136,936 tons; and in 1899, 140,371 tons.

Messrs. Bradbury and Hirsch estimate the production of sulphate of ammonia in the United Kingdom during 1899, from all sources, at 202,000 tons, apportioned as follows:—

	Tons.
Gas-works	133,000
Iron ,,	18,700
Shale ,,	37,300
Coke and carbonizing works	13,000
	202,000

Of this production they reckon that England contributed 128,200 tons; Scotland, 71,000 tons; and Ireland, 2800 tons. The production during the previous five years was as follows:—

	1898.	1897.	1896.	1895.	1894.
Gas-works	130,000	133,000	127,500	119,600	113,500
Iron ,,	17,700	18,000	16,500	14,600	10,000
Shale ,,	37,300	37,000	38,000	38,300	33,000
Coke and carbonizing works	11,500	10,000	9,000	7,000	3,500
Totals	196,500	198,000	191,000	179,500	160,000

The production in 1898 from gas-works proved to be below their estimate, and, for the first time since records have been kept, showed a decline on the preceding year. Notwithstanding electric lighting and the use of water gas and other illuminants in recent years, the production of sulphate of ammonia from gas-works continued to increase up to 1898, though in varying ratios, from year to year; and, having regard to the condition of trade in that year, the shrinkage in the output of sulphate of ammonia is somewhat puzzling to the authors. They noted last year, and called particular attention to the fact, that whereas the ratio of increase in the production of sulphate from gas-works was 6 per cent. in 1896 as compared with 1895, the ratio in 1897 as compared with 1896 was only 4 per cent.; but they did not anticipate that the 1898 production had fallen below that of 1897, knowing, as they did, that in many large trade centres there was an increase in the consumption of coal gas of 5 per cent. and upwards. No doubt the extended use of other illuminants was, they say, the main cause of the shrinkage; but they are inclined to think that the comparative immunity from fogs in the winter months was also a contributing factor. In 1899, there was a slight increase in production from gas-works; but the authors' estimate of the United Kingdom production from all sources shows an increase of only 5500 tons over that for 1898. The production from coke and carbonizing works was rather larger than that for 1898; but the output from shale appears to be about a fixed quantity. The rapid expansion in output from all sources experienced between 1893 and 1897 has entirely disappeared; and although the proceeds from sulphate of ammonia are an important item in the revenues of producers, the rate of output is determined by considerations quite apart from the market price. Messrs. Bradbury and Hirsch have reason to think that the stock of sulphate in makers' hands at the end of 1898 did not exceed 4000 tons, and that their estimate of the home consumption, which can only be approximately ascertained, was put too high. There was a further falling off in home consumption in 1899, owing to advanced prices over the spring months and to the smaller requirements of manure manufacturers for compounds; the tendency being still, with foreign buyers in particular, in the direction of making their own mixtures. Exports show an increase of 3500 tons, as compared with those for 1898. The year's working therefore shows—

	Tons.
Stock brought forward from 1898	4,000
Production in 1899	202,000
Available supply	206,000
Exports in 1899	140,500
Home consumption in 1899	58,500
Stock carried forward to 1900	7,000
	206,000

Although the stock in makers' hands is rather more than a bare working stock, it is understood that part of this is sold, and that shipment has been delayed owing to interruption of inland transit on the Continent. Probably the quantity so delayed amounts to 2000 tons—the difference between the shipments in December, 1898, and those in December, 1899. Practically, therefore, the year 1900 is entered upon with but a bare working stock; and, as purchases have probably also been delayed, Messrs. Bradbury and Hirsch say the outlook for January is decidedly promising. If a more extended view is taken, the increase of production in the United Kingdom cannot well exceed some 3000 tons between January and June, so that statistically the position is a strong one, while other conditions seem to favour a high range of prices over the spring season. With regard to the relative merits of sulphate of ammonia and nitrate of soda, Messrs. Bradbury and Hirsch think they cannot do better than refer their friends to Mr. J. Muir's admirable essay, which gained the prize of £500 offered by the Sulphate of Ammonia Committee, in which they say the subject is exhaustively treated.* They say it is, perhaps, too elaborate for a farmer's handbook; but the question is discussed at length and in intelligible terms. Mr. Muir does not try to prove too much, or to go farther than his facts will carry him. He establishes the superiority of sulphate of ammonia on the whole, and especially in regard to yield and keeping properties, provided it is used with the knowledge and judgment he seeks to inculcate. He admits, however, that for certain crops and under certain conditions the unit of nitrogen in nitrate of soda is equally effective, and that for certain other crops it is superior to sulphate of ammonia. These are conclusions which, as the authors point out, the more intelligent and enterprising users had already arrived at by experiment; but, now that the subject has been authoritatively dealt with, farmers will, they say, be able to proceed with more exact knowledge, and therefore greater confidence. For the present, however, they are afraid that the relative dearness of sulphate of ammonia will prevent a larger use of it when nitrate of soda is the alternative. In the situation, as a whole, they think producers may find reason for a hopeful attitude, though £1 per ton advance in price over that at the end of 1898 must necessarily make some difference in consumption, even where nitrate of soda is not in question.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 7, sulphate was 10s. 2½d., and nitrate 7s. 9d. per cwt.; on April 1, the prices were 10s. 10½d. and 8s. 9d.; at Midsummer, they were 12s. 3¾d. and 8s. 3d.; at Michaelmas, they were 11s. 6d. and 7s. 9d.; while at the close of the year they were 11s. and 8s. respectively. The second table gives the average prices per ton of good grey (24 per cent.) sulphate, f.o.b. Hull; the figures ranging over 33 years—1867 to 1899. The following are the averages for the past ten years: 1890, £11 9s.; 1891, £10 15s. 5d.; 1892, £10 1s. 10½d.; 1893, £12 11s. 4½d.; 1894, £13 3s. 8½d.; 1895, £9 15s. 4½d.; 1896, £7 18s. 0½d.; 1897, £7 18s. 4¾d.; 1898, £9 9s. 7½d.; and 1899, £11 5s. 9¾d. The third table shows the average prices per hundredweight of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1890, 8s. 2d.; 1891, 8s. 9½d.; 1892, 8s. 9½d.; 1893, 9s. 5½d.; 1894, 9s. 4½d.; 1895, 8s. 2½d.; 1896, 7s. 11½d.; 1897, 7s. 9½d.; 1898, 7s. 6¾d.; and 1899, 7s. 11¾d.

*See "JOURNAL," Vol. LXXIV., pp. 163, 223, 287, 359.

FATAL ACCIDENT AT THE STOKE GAS-WORKS.

The latter end of the past, and the beginning of the present year have unhappily been marked by an unusual succession of accidents in gas-works. The latest addition to the list was made about noon last Wednesday, when an accident occurred at the Stoke Gas-Works which was unfortunately attended by fatal results. A new retort-house was in course of construction; the contract being in the hands of Messrs. Dempster and Sons, Limited, of Elland, with Mr. H. P. Embery, a builder, of Fenton, as sub-Contractor. When completed, the building will be 120 feet long and 70 feet wide; but only a portion of it—62 feet of the entire length—was being put up. The walls were practically finished, and seven iron principals had been placed in position for the support of the roof. Each principal was to carry about 60 bars. About half this number had been attached; and the work of fixing the remainder was proceeding. Within the building, a commencement was being made with the retort-benches. While this was going on, and while some bricklayers were at work on scaffolding at the end of the building, at a height of something like 34 feet, there was a sudden gust of wind, which was very high at the time, and its effect was to overturn the end principal. In falling it knocked over five of the others; but the seventh, though thrust out of position, did not fall. The mass of ironwork crashed into the house, bringing down the scaffolding with all upon it. A number of the stokers who were at work in the adjoining retort-house immediately ran to the new building to ascertain if any personal injury had been caused. They found in the centre of the house a bricklayer named Peter Plumb, a married man living at Newcastle, who had been erecting the retort-bench. It was at once seen that he was dead; one of the principals having fallen upon him. Six other men were more or less seriously injured—James Wheatley, William Lamb, and Thomas Mapp, bricklayers, and John M'Gann, a labourer, who were knocked off the scaffolding; and John Sherlock and Charles Crowther who were working underneath. Plumb's body was conveyed to the police station to await the inquest; and the injured men, after receiving attention from doctors who were promptly upon the scene, were removed to the Infirmary. Our latest information is that two of the men who were only slightly injured are now walking about; but of the other four sufferers, who were detained at the Infirmary, two are in a serious condition. They are, however, considering the nature of their injuries, doing very well; and the House-Surgeon feels exceedingly hopeful that they will recover.

An inquiry into the circumstances attending Plumb's death was opened by Mr. W. H. Adams, the Deputy-Coroner, on Friday afternoon. Messrs. Dempster and Sons were represented by Mr. Hurd; Mr. Embery, by Mr. W. F. Holtom; while Mr. J. B. Sproston appeared on behalf of the relatives of the deceased. Mr. J. H. Walmsley, one of Her Majesty's Inspectors of Factories, was in attendance; and the Town Clerk (Mr. J. B. Ashwell) watched the proceedings for the Corporation. The first witness called was John Armitage Garside, of Huddersfield. He said he was a plater and erector, employed at present at the Stoke Corporation Gas-Works by Messrs. Dempster. At the time of the accident, he was standing in the centre of the new retort-house. The walls were up, and seven principals were in position. He was looking up when suddenly there came a gust of wind, causing him to remark to one of the men that it seemed wild up where he was. Scarcely had he said the words than all the principals began to fall towards the south side of the building. He ran to get out of the way; and the next thing he saw was that they were on the ground. Deceased was working on the foundation of the new retort-bed, and was a little to the south of the centre of the building. After the fall, witness went to the place where the deceased had been, and found he was dead. The first of the principals was put up on the 3rd inst., on the south side next to the gable end. The practice in getting principals up was first to get one in position, and then attach guy-ropes. A second principal was then put up, and purlins were put on—five on each side. Another principal was got up, and five more purlins were put on, cross-jointed, and bolted. This proceeded until the last principal was up, and then they started to put purlins on the side nearest the works. They had three parts of these done when the accident happened. All the purlins on were completely bolted at the time, and he considered that what they did was sufficient. At the shoe of the principals holes were bored, in which they sometimes put bolts; but they would not have put them in in this case. He did not consider it necessary. The Coroner asked if the fact of the holes being bored did not look as if the engineers thought it necessary that the principals should be bolted to the beds on which they rested. Witness replied that this was not so. The principals usually came to them with the holes bored, but the bolts were seldom put in. Asked how he accounted for the accident, he said there came a strong gust of wind, and he accounted for it by that. It had been very stormy all the morning. In cross-examination by Mr. Holtom, witness said to his mind the accident could not in any way be attributed to the brickwork, which was well set. Very few bricks had fallen. Mr. J. W. Broadhead, Managing-Director to Messrs. Dempster, said the bolts referred to by the last witness would have been used in this case, but they were quite unnecessary; it was simply waste of time, labour, and materials to put them in. If they had been used in this instance, it would have been simply because they were specified in the contract. Some specifications provided for them; but why they should do so, he did not know. He was not sure that some were not in when the accident happened; but it was not usual to fill them in with lead until all the other work of fixing had been completed. They were always leaded afterwards, for adjustment purposes. If all these bolts in the shoes had been fixed and leaded, it could not have made the slightest difference to the accident happening. It was a sort of miracle to him how the accident did occur. He could only account for it by an extraordinary gust of wind. To his mind this alone was the cause of it. Other evidence was given by Frank Wood, Edward Whiteley, and William Heald. The former said he heard a strong gust of wind, which shook the purlins badly. He ran out of the house, and the crash came while he had his back to the building. Whiteley stated that there was a gust of wind so strong as to cause him to drop the angle-iron he had at the time. A few minutes afterwards he found that the principals were moving, and he leapt to the wall just in time to escape the fall. The Jury returned a verdict of "Accidental death," everybody being exonerated from blame; all the necessary precautions having (apparently) been taken to prevent such an occurrence.

MORECAMBE GAS-WORKS TRANSFER.

An extraordinary meeting of the Morecambe Gas Company was held last Thursday, when the purchase price agreed upon between the Directors and the District Council for the sale of the undertaking was formally ratified. The Directors were authorized to take the necessary steps to protect the interests of the Company during the progress of the Council's Bill through Parliament next session. The purchase price agreed upon is £141,000, which will be further increased by the amount of the reserve fund and the balance in hand on July 1 next, and by the valuation of the materials on the premises at that date. The Council pay all the costs of the transfer and negotiations. A resolution authorizing the promotion of a Bill to empower the purchase of the concern was passed at the last meeting of the Council, with only one dissentient—Mr. Johnson, who considered the agreed price an unreasonable one.

According to the "Lancaster Guardian," a good many Morecambrians are dubious, and not without reason, about the purchase of the undertaking. "Whether," says our contemporary, "the price agreed to be paid for the works is likely to be remunerative is a question upon which grave doubt has been expressed in several quarters, especially in view of the fact that electric lighting is an established thing, and that the District Council themselves are the largest consumers of the new illuminant. The agreed price is put at £141,000—practically three times the amount of the capital and loans of the Company. But this will not be the total sum; for there remains to be added the value of the stock-in-trade on the premises, the costs of the negotiations for transfer, of getting the Bill through Parliament, and so on. Roughly the gross cost may be put at £145,000—a figure which will probably be under the mark rather than over. It is not likely that the Council will be able to borrow the money at a less rate of interest than 3½ per cent., or that a longer period than forty years will be allowed for the redemption of principal and interest. Assuming that they are able to get the amount from an assurance company under these conditions, and on what is called the annuity principle, the sum to be set aside each year for the repayment of principal and interest will be something like £6790. Supposing that only thirty years be allowed for redemption and interest, the annual payment will be larger still, probably £7800 odd. Of course, the Council may be disposed to borrow the money from the Public Works Loan Commissioners; and in that case it would probably be advanced under a sliding-scale—the payment being considerable in the earlier years, but gradually diminishing towards the close of the period. But averaged over the whole period, the annual payment will not differ greatly from those already mentioned. The gross profits of the Gas Company for the year ending June 30 last are put down as £5483. The general result of the acquisition of undertakings of this sort by local authorities is a considerable improvement in management, greater economy in working, and a corresponding increase in the profits; and though this may be the case at Morecambe, it is probable that a very considerable period will have to elapse before the undertaking can be regarded as a paying concern from the standpoint of the ordinary ratepayer."

PROPOSED GAS WORKERS' FRIENDLY SOCIETY IN GLASGOW.

A Meeting was held towards the end of the past year of a Special Sub-Committee of the Glasgow Gas Trust on the subject of a proposed Friendly Society for the men employed in the Gas Department. Having considered the matter, under the remit made to them by the Gas Committee on March 29, 1899, the Sub-Committee passed the following minute, recommending that such a Society be instituted by the Department on lines similar to those upon which the Friendly Societies in connection with the Tramways Department has been established:—

1. —The membership to be optional, and to be confined to the workmen employed in the various gas-works, the meter-repairing department, and the streets-mains department, who are in receipt of weekly wages. All workmen on leaving the service permanently to cease to be members, and will receive back a proportion of their contributions.
2. —The objects will be: (1) mutual relief of members in case of sickness or accident; (2) allowance on the death of a member; (3) allowance on the death of a member's wife; (4) medical attendance and medicines to members; and (5) contributions to infirmaries and kindred institutions.
3. —Weekly contributions by the members, augmented by a contribution from the Gas Committee.
4. —The Committee of Management to be composed of members elected by the Society, and nominees of the Gas Committee, in proportion to their contributions.
5. —The funds to be placed in the hands of two Trustees—viz., the Chairman of the Gas Committee for the time being, and the General Manager for the time being of the gas undertaking, who will appoint the Secretary and Treasurer.

As the Corporation have no statutory power to contribute to the funds of the proposed Society, the Special Sub-Committee also agreed to recommend that, in the first Bill to be hereafter promoted in Parliament by the Corporation, the requisite authority should be asked for making such contributions. The Special Sub-Committee further agreed to recommend that, as the statutory powers of the Corporation Gas Department to pay any superannuation allowances are restricted to certain officers and servants of the old Gas Companies who are still in the service of the Corporation, parliamentary authority should at the same time be applied for to establish a superannuation fund in connection with the Gas Department which will be compulsory, and applicable to all the servants of the department, and also for authority to take over and appropriate for the purposes of the fund the money handed over by the old Gas Companies to the Corporation for benevolent objects, which on May 31, 1899, amounted to £3386.

The Special Sub-Committee, in submitting the recommendations contained in this minute, pointed out that it is not intended that the adoption of either or both of the schemes proposed should exempt the Corporation from their responsibilities under the Employers' Liability

Act, 1880, and the Workmen's Compensation Act, 1897. In order to accomplish this end, it would be necessary that one or other of the proposed schemes should comply with the requirements of the "contracting-out" clause of the last-mentioned Act, one of which is that the Registrar of Friendly Societies should certify that the adopted scheme "is, on the whole, not less favourable to the general body of workmen and their dependents" than the provisions of the Act, with reference to compensation claimable under the same for fatal or other accidents.

The minute above referred to is expected to be brought before an early meeting of the Gas Committee, and eventually submitted to the Town Council.

THE HALIFAX GAS COMMITTEE AND FREE LABOUR.

There was much talk, at a recent meeting of the Halifax Corporation, over a contribution of £5 5s. made by the Gas Committee to the funds of the Free Labour Association. It appeared in a lump sum of £23 17s. 3d., which came before the Corporation in an item of "accounts under £2." Mr. Parker objected to this, and asked why the amount was not paid in the usual open way. The Chairman of the Committee (Alderman Woodhead) said he could not answer the question; but there was nothing secret about the Committee's accounts. Mr. Parker went on to say that, having had this explanation, he must move that the accounts under £2 be referred back to the Committee. He felt sure the members had not understood that they had voted this five guineas as a subscription to the Labour Protection Association. That body was connected with the Free Labour Association, the object of which was, avowedly, the smashing of Trade Unions. As members of the Council, their business was not to represent a clique or any side whatever, but the whole of the burgesses; and the Gas Committee, he submitted, had no more right to pay a subscription out of the rates to an Association for smashing Trade Unionism than they had to pay one for building it up. Mr. Maude, in seconding the motion, urged that, before making such a subscription, the Committee ought to have sought the sanction of the Council. Other speakers having expressed the same views, Alderman Woodhead expressed surprise that there should be two opinions about entrusting the Committee with the expenditure of five guineas. He contended that, if any outlay was ever incurred in the interests of the ratepayers, this subscription was of that character. The Council knew perfectly well that, if they had not had actual threats, they had had veiled threats that there was going to be a strike at the gas-works. They would have blamed the Committee if they had not taken every possible precaution to ensure a supply of gas being given to the town in any eventuality. That any member of the Council should get up and say that five guineas spent in this way was wrongful expenditure, astonished him. The subscription was not paid to bolster up any Free Labour Association. It was a legitimate expenditure in the interests of the ratepayers, incurred by a Sub-Committee, and sanctioned by the full Committee without comment. Something had been endeavoured to be made out of it that evening which did not belong to it at all. The Accountant (Mr. Nicholl) having explained that the inclusion of the item in the accounts under £2 was the result of an error, Mr. Parker said it was a funny proceeding. For anything the Council knew, they might have been subscribing to half-a-dozen associations to which they might object. He was opposed to the Council taking sides in matters of this description. The motion was carried with only one dissentient—Alderman Woodhead.

"GAS-FOUNTAIN" EXHIBITION IN EDINBURGH.

The Edinburgh evening newspapers last Friday contained reports of an exhibition in the office of Mr. John Macdonald, No. 88, Queen Street, of the "gas fountain" invented by M. Bouchaud-Praceig, and referred to in the "JOURNAL" for the 26th ult. (pp. 1553-54). Besides the inventor, there were present Sir Edward Reed, K.C.B., the Chairman of an English Syndicate, Baron de Watteville, a Director of the original French Syndicate, and Mr. Ward, the Advising Engineer to the Company. The apparatus by means of which the process of producing the gas is carried out is a tin canister or "fountain"—the larger size shown being about 20 inches high and 6 inches in diameter, not unlike a biscuit-box in appearance. Two tubes project from the top—one entering the canister, and no more, to let in air; the other being carried through the fountain to the bottom, and serving to carry the gas off. Packed in the canister are a number of little squares of wood of absorbing properties so great that each will contain nearly its bulk of liquid. This is the apparatus as it comes from the manufacturer. All that is required to convert it into a real "gas fountain" is to pour into it a quantity of petrol, or other gas-producing liquid, when, the air entering by one of the top tubes, gas is at once generated, and flows, as required, from the other tube. A number of such "fountains" were employed in the demonstration—one in connection with a cooking-stove, another in conjunction with an ordinary gas heating-stove, and others for the purpose of supplying the illuminant to reading and table lamps of various shapes and sizes. Completeness was lent to the exhibition by the fact that the company had the opportunity of witnessing the practical application of the method to traction. The oil-tank and carburetter and their connections having previously been removed from one of the cars of the Edinburgh Autocar Company and a "fountain" and pipes fixed in their place, the vehicle was seen running along Queen Street very nicely. Mr. Ward gave a full explanation of the invention; pointing out its advantages owing to the portable nature of the apparatus. He laid emphasis on the fact that there was no danger of combustion or explosion—a fact which was demonstrated in a very interesting fashion by the inventor; and he claimed that whether for lighting, heating, or motor power, the system had advantages in point of cost over others which are known. It is stated that a canister 20 inches in length is capable of supplying a light of 10 candles for 200 hours; and the cost of the charging liquid is expected to be only about 1s. 9d. per 1000 cubic feet.

ELECTRIC LIGHTING NOTES.

The Eastbourne Town Council have entered into possession of the undertaking of the local Electric Light Company. A cheque for £88,135 has been paid over to the representatives of the latter; the sum including £6000 on account of capital expenditure agreed to be borne by the Corporation.

The Alfreton District Council have not secured much satisfaction out of a circular they recently issued to ascertain the feeling of the ratepayers on the question of adopting the electric light. The number of papers distributed was 751. Those in favour of electricity voted up to the number of 181; while 106 voted, but did not promise to use it. The votes against the scheme numbered 56; 28 signed, but did not answer the questions; and 380 papers were returned blank.

A special meeting of the Gloucester City Council was held last Tuesday, when tenders were accepted for extensions to the electric light installation. The original plant provided for 12,000 8-candle lamps for private lighting; and of these all are taken except 229, though they will not be available, as the works will not be finished before next winter. It was resolved to apply to the Local Government Board for power to borrow a further sum of £9425 for such extension, and £8575 for a refuse destructor.

Recently, at considerable expense, the Congregational Church at Rake Lane, Liscard, was fitted with the electric light, and the new illuminant for a time gave satisfaction. On the evening of last Sunday week, however, when the time came for lighting up, the attendant found the supply of electricity cut off, owing, it is presumed, to some defect in connection with the cable. Fortunately gas-brackets had been retained at each end of the church, and these were brought into requisition; but the body of the church was enveloped in gloom.

At the meeting of the Redditch Rural District Council last Tuesday, the Lighting Committee drew attention to the failures of the electric light in the town, both in the public lamps and among private consumers. Mr. Hiscock stated that in one street there had been practically no light for a fortnight, and there had been several failures for longer or shorter periods since the electric lighting scheme was put in operation. The opinion was expressed by several members that the public would be chary of adopting the light in its present unreliable form. It was finally decided to apply for sanction to borrow £8000 in connection with the extension of the electric lighting scheme.

The Dartmouth Town Council do not appear to be overburdened with enthusiasm for the electric light, which has been forced upon their attention by one of the Companies who are exploiting the smaller towns in the West of England. At a meeting of the Council last week, the question was referred to a Committee composed of the Mayor and two other gentlemen, who were authorized to call in an expert. The Town Clerk remarked that he had already called two meetings to consider the subject. At the first the Mayor attended, and waited half-an-hour for others to put in an appearance; but no one came. The second meeting was attended only by the Town Clerk. The members laughed at this; and their whole attitude towards the scheme suggests that they had little faith in its realization.

The City of London Electric Lighting Company have deposited a Bill in which they ask for the curious power to abolish their depreciation and reserve funds, and to apply those already accumulated for these purposes in any way that "the Board of Directors may determine." The preamble to the Bill states that the obligations to provide the funds were undertaken by their predecessors, and were adopted by the Company in consideration of the Commissioners of Sewers granting them the exclusive right of supplying electricity for private purposes within the City of London during a period of 21 years. Now that opposition has been fostered, the Directors contend that it is just and expedient, in the above circumstances, that the Company should be relieved from the obligations imposed on them in relation to their accounts, and the setting aside of depreciation and reserve funds.

Mr. G. C. T. Bartley, M.P., wrote to "The Times" last Friday as follows on the subject of a new electric light danger: "Last week, when turning on the electric light on my study table, it exploded with a report like a pistol. The socket of the lamp was blown out, and the glass, in myriads of atoms, sent in all directions. Fortunately, a tilted shade saved my face; but I must have had some of the dust in one eye, for I am still confined to my room and cannot even read. The lamps had been supplied by the Westminster Company a week or so before Christmas, when they changed all the lamps on doubling the voltage of the current. They say doubling the voltage has nothing to do with the accident. But they cannot explain it; and I think users of the electric light should be warned, as this danger exists, to put some protection on the lamps which they use close to their faces, as I certainly shall do for the future."

There is a little irritation in the Sheffield City Council over the position taken up by the Local Government Board in connection with the Council's application for sanction to borrow £100,000 for the purposes of their electric light undertaking. The Board have determined to comply with the application only so far as it relates to the borrowing of £71,120. The sums which the Board have excluded from the loan are: Prospective expenditure on machinery, £12,280; steam-boilers, steam-pipes, condensers, &c., £9000; and machinery connected with proposed public lighting, £7600—making a total of £28,880. The Board defer giving a decision as regards these sums until the Town Council are in a position to furnish more precise information as to them; and in connection with any application which may hereafter be made for sanction to a further loan for the purposes of the undertaking, they state that they will require to be furnished with full particulars of the expenditure of the loan now sanctioned.

At last Wednesday's meeting of the Woking Urban District Council, the Electric Light Committee reported that they had considered the draft Provisional Order of the Woking Electric Supply Company, Limited, and decided to ask for the insertion of the following clauses and amendments: (1) A clause giving the Council power to purchase at the end of 15 years the portion of the undertaking then within their district, upon the terms of section 2 of the Electric Lighting Act, 1888. (2) Section 15 of the Order of 1899 to be so extended that no works be carried out in private streets without notice to, and deposit of a plan with, the Local Authority. (3) Section 32 of the general Order to be so amended that a

revision of prices may be applied for after each three years, instead of after each seven years. (4) The cost of public lighting, including maintenance and repairs (but not erection of standards), shall not exceed £3 per lamp per 25-candle power for 2000 hours; and an addition to that effect be made to clause 34 of the Act of 1899. (5) The maximum for each unit over and above 20 units to be 7d. instead of 8d.; and the fourth schedule to the special Order to be amended accordingly. The Clerk was authorized to instruct Counsel to settle clauses and amendments, and to advise.

There was a failure of the electric light at Southampton on the evening of Saturday, the 6th inst.; and the occurrence occasioned considerable inconvenience in many directions. The arc lamps in the main streets went out at 6.30, and simultaneously the light failed in business establishments and private houses. In about half-an-hour the street-lamps were alight again, and connection was re-established at the two theatres, the Royal Southampton Yacht Club, and buildings in the upper part of the town. With regard to the High Street and the lower district, however, it was found impossible to set matters right; and the tradesmen who did not close their shops were obliged to adopt such illuminants as could be procured at short notice. They presented in some cases a very strange appearance. For instance, a chemist had a long row of candles on the edge of his counter; and to prevent the grease from running about, had stuck the ends in pill-boxes. According to a statement reported to have been made by the Chief Electrical Engineer (Mr. F. H. Chaplin), the cause of the accident was a particularly bad short-circuit on some of the old copper-strip; and it had not been located on the following morning, though the staff had been hard at work since the failure.

It is fortunate for the Manchester Royal Exchange that, when electric lighting was introduced a few years back all through the building, the precaution was taken of retaining complete the system of gas lighting, as on several occasions it has proved very serviceable, and prevented serious inconvenience on 'Change and in other parts of the building. During the course of a week, there have been no less than three breakdowns in the lighting, on each occasion on the principal market days. The first, as already mentioned in the "JOURNAL," was caused last Friday week by an explosion in the electric mains immediately outside the building, which at once put out all the lights; while occurring as it did just at "high 'Change," it caused no little excitement among the members, and a temporary stoppage of business until the cause was ascertained, and the Exchange again lit up by means of gas. On the following Tuesday, there was another breakdown, which fortunately occurred when business was practically over; but the whole of the building and the offices lighted by electricity were for a time put in darkness, and their old friend gas had again to be brought into use. Last Friday there was a third failure, and the gas supply had again to be requisitioned. On this occasion the matter was, as on the previous Friday, more serious. The breakdown occurred about four o'clock, the time of second 'Change. The members were plunged in darkness until the gas could be lighted; and the electric light had not been restored when the Exchange closed.

At the Town Hall, Oldham, last Wednesday, Mr. H. Percy Boulnois, one of the Inspectors of the Local Government Board, held an inquiry with respect to the application by the Corporation for leave to borrow £36,000 for the purpose of paying for extensive additions to the electric light station, the erection of a new boiler-house, and extension of the plant. The Town Clerk (Mr. A. Nicholson), in opening the case for the applicants, said the extensions of the generating station were rendered necessary by the fact that the Corporation were at present unable to cope with the demand for energy. The electric lighting had been the most satisfactory work the Corporation had taken in hand. This was the fourth time the Corporation had had to apply for borrowing powers to extend the station. With the completion of the present scheme, the whole of the site of the station would be built upon; and the Corporation intended to establish a new station on the other side of the railway line some little distance away. The total capital expenditure to date was £57,109, and the total borrowing powers amounted to £52,000; so that the Corporation had over-expended by £5109, against which, however, they had a sum of £5159 in reserve. The Electrical Engineer (Mr. Newington) said the increased demand since the 25th of March was 37 per cent. Mr. Stephen Wall, a ratepayer, while not objecting to the expenditure, expressed disapproval of the practice of proceeding with works first and then applying for leave to borrow the money for them. In this case, he said, large contracts had been let and partly carried out. The Inspector said he should certainly have to report on this matter to the Local Government Board.

According to Alderman Radford, the Chairman of the Electricity Committee, the Plymouth municipal electricity undertaking is expected to establish a record. In moving the adoption of the report, which the Committee presented to the Town Council yesterday week, recommending that £48,000 be borrowed for the extension of the works, he predicted that at the end of the first six months' working the Committee will be able to pay all their expenses, together with the instalment of interest and sinking fund for that time. If this expectation is realized, the Plymouth works will, he explained, be the pioneer in paying their way in the first six months after being established. With an increased output—which the proposed new capital expenditure is to provide for—the cost of working will be relatively cheaper; and if by the beginning of next winter the Committee are able to supply all the demands made upon them, they will, he prophesies, be able, even in the first year of working, to hand over a considerable sum in relief of the rates. As previously explained in the "JOURNAL," the Plymouth electricity works are the first in the kingdom which have been established and set to work under the conditions which now find most favour with electrical engineers—viz., a tramway as well as a lighting load. The demand for current for lighting purposes has exceeded expectations; but the Corporation are their own best customers, as, in addition to the current for the tramways, they are users of a good deal for arc lamps in the streets and for the lighting of the various municipal buildings. In the Municipal Offices, Guildhall, Markets, Free Library, and other departments, gas is being displaced by electric light; and this will no doubt continue until all the buildings over which the Corporation have control are lighted in this way. The original estimate of the capital outlay on the works was £45,000; but the actual cost was £55,720, and additional works were sanctioned which brought the expenditure up to nearly £60,000. The new works now needed will cost £35,000; the balance of £13,000 which makes up the proposed loan of £48,000 being required to meet the expenditure already incurred in excess of the first estimate.

The Sudbury (Suffolk) Town Council have received a report from Mr. W. C. C. Hawtayne on the subject of the electric light scheme for the town. Very naturally, in this gentleman's opinion, the town offers a good field for electricity supply; but other people who know the town as well as, if not better than, Mr. Hawtayne may hold a contrary view. Altogether, he considers the town far superior to many where the establishment of similar works have been remunerative. It would be interesting to know the names of the towns comprised in that word "many," and the extent of their success. He advises that certain streets be lighted; and he believes that, "within a few years" (which is rather an elastic expression), consumers will be connected to the mains using about 8000 8-candle power lamps. But not to commit himself too far, Mr. Hawtayne in his report only considers the connection of 6000 lamps. It is very clear, however, that even this sanguine expert does not anticipate that there will be a very rapid influx of customers, for he says: "The lighting can be effected quite as economically as with gas; the only *slight* drawback being that mains must be laid in streets in which very little demand will be made at present by private consumers. It will not, therefore, pay to lay larger mains than absolutely necessary; *the roads being re-opened when a demand arises* for the laying of additional mains for supplying private consumers." In connection with the first part of this statement, it may be noted that the proposed compulsory area comprises about a dozen streets, in only three or four of which anything approaching a reasonable demand is likely to arise. The cost of the undertaking he puts at, in round figures, £16,300. As to the financial results of the working, he estimates that each of the 6000 private lamps will consume 16 units per annum, or a total of 96,000 units; and, adding 10,500 units for public lighting, the total output will be 106,500 units. Then, he says, it will not be necessary to charge more than 5½d. per unit, "now generally reckoned as the equivalent of gas at 2s. 9d. per 1000 cubic feet." Mr. Hawtayne should have added after the word reckoned "by electricians," as the accounts of electricity consumers do not appear to always bear out the assertion as to the two-and-ninepenny equivalent. Anyway, on Mr. Hawtayne's figures, the revenue would amount to £2473; and the profit and loss account would show a net profit of £309 13s., after allowing for repayment of capital and interest. In a quarter or a third of a century, if the present councillors are spared that time, they will have the joy of seeing, when the loan is all repaid, that the profits will be materially increased—that is, of course, assuming a profit is made before then. Supposing 6000 private lamps are not connected, and supposing 16 units per annum are not consumed per lamp, where will that lean profit of £309 13s. be? Is such a return as this worth the risk in a town like Sudbury? The report also deals with the question of tacking on to the electric lighting scheme a refuse destructor, at an additional cost of £2000. In urging the adoption of this destructor project, Mr. Hawtayne refers to Epsom as being a town similar to Sudbury. Electricians and gas people seem to look at places through different spectacles. Both Epsom and Sudbury have small populations; but Epsom exceeds Sudbury by something like a thousand. And in these comparisons it is not so much the size as the character of the population. The bulk of the people of Epsom are wealthy compared with the inhabitants of Sudbury; and this is reflected in the respective positions of the gas suppliers. At Sudbury, there are only about half the number of gas consumers that there are at Epsom, and the latter town has a consumption four times that of the former. Considering that a 16-candle gas is supplied at Sudbury as against 14½ candles at Epsom, the difference in the price is not great. It is, we believe, 4s. 7d. and 4s. at Sudbury, against an all-round charge of 3s. 8d. at Epsom. This small difference does not account for the better position of the one compared with the other in the number of consumers and the average consumption per consumer. It is that one town possesses a better-class population than the other; and if electric lighting is adopted in Sudbury, we venture to predict that the Town Council will see in time that there is truth in this. However, the present position at Sudbury is this: The few members of the Town Council who appear to dominate their fellow councillors have decided, for some occult reason, that there shall not be a public meeting on the subject; but a canvass is to be made of the persons likely to become consumers. The result of this canvass will determine future action.

Carmarthen New Water-Works.—These works, which will cost something like £25,000, exclusive of unforeseen necessaries, are satisfactorily progressing, thanks to the activity of the Surveyor, and the facilities afforded him by the Corporation. The works indeed are so far complete that last Tuesday the Mayor (Mr. Walter Spurrell, J.P.), and most of the members of the Town Council drove to the Rock and Fountain—a very appropriate name for the basis of such a supply—and formally affixed the last joint to the pipes, and turned on the water.

Gas-Engines for Driving Electric Lighting Plant.—At the last monthly meeting of the Chesterfield Town Council, Alderman Clayton moved—"That it be a recommendation to the Electrical Energy Committee to consider and report on the desirability of using gas-engines for the purpose of the generating station to be provided for the borough." He said he had been informed, by people competent to express an opinion on the matter, that gas-engines could be as effectively employed for the purpose mentioned as steam, and quite as cheaply; and he was also informed that the people with whom the Committee were in treaty for the supply of the generating plant were the makers of the best gas-engines on the market. If, as he had been informed by experts was the case, gas-engines could be employed as cheaply as steam-engines at the electricity generating station, their plain duty was to have them. Mr. Markham, in supporting the motion, said it was desirable to know exactly how far the town intended to go into the electricity business. For a small generating plant of (say) 200-horse power, gas-engines were preferable to steam-engines; but for a plant of 500 to 1000 horse power, steam was the most desirable agent. He did not believe there would ever be a great demand for electricity in Chesterfield; and if it was not intended to utilize it as a power for working tramcars, he considered gas-engines would be best for generating purposes.

AN ARBITRATION RESPECTING THE DRONFIELD WATER SUPPLY.

On Friday, the 5th inst., and the following Monday, the Town Clerk of Nottingham (Sir Samuel G. Johnson), who is standing Arbitrator of the Derwent Valley Water Board, sat at the Guildhall, Nottingham, to arbitrate in a dispute as to the water supply, between the Dronfield District Council and the Chesterfield Rural District Council. Sir Samuel was asked to decide whether the Chesterfield Council, as successors of the Chesterfield Board of Guardians, had fulfilled their obligations under an agreement dated Oct. 16, 1880, and made between the Guardians and the Dronfield Local Board, now the District Council. He was also desired to consider a claim relating to an agreement between the Authorities for Dronfield to pay £3500, and receive a supply of water, and in addition to contribute a certain sum towards the cost of maintenance of the works. It appeared that the sum of £3500 was paid by the Council; but for some reason or other from 1883 until Michaelmas, 1898, no demand was made by the Chesterfield Council for any contribution in respect of maintenance. The amount was estimated by the Engineer; and as a result an account was ultimately submitted to the Dronfield Council for £545 3s. 1d. At the close of a mass of argument and evidence, the Arbitrator said he sympathized very much with both public bodies in the position in which they were placed. No doubt both Authorities were well advised. But it must be patent that Dronfield and Chesterfield were so situate that they must work to their common advantage; and unless a way was found to do this, he could see nothing but perpetual litigation between the two bodies. He impressed upon both that his feeling was that they ought to come together in an amicable and friendly spirit, and, in the future, settle their disputes without litigation. He should, therefore, extend the time before he gave his award, in order that the parties might come to some agreement between themselves. The learned Counsel concerned intimated that the views of the Arbitrator should be laid before the Authorities.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. Joseph Burgess, retired from the active conduct of the agitation among the Glasgow Corporation Gas Workers, as stated last week, transferred to the Central Office of the Gas Workers' Union the task of replying to the letter of Mr. A. R. Cawley, Manager of the Llanelly Gas Company. The reply, such as it is, has come from Mr. W. Thorne, the General Secretary of the Union, and it appeared in the "Glasgow Herald" last Wednesday. It was as follows:—

My attention has been called to a letter from Mr. Cawley, Manager of the Llanelly Gas-Works, which appeared in your issue of the 2nd inst. [*ante*, p. 96]. In this letter, Mr. Cawley tries to throw discredit upon the management and policy of the Gas Workers' and General Labourers' Union because the stokers at his works threw down their tools without notice. But as he does not give the reasons why the men did this, perhaps you will be good enough to allow me space to give their reasons for doing so.

In January, 1898, the management posted up a notice to the effect that when the time came for shortening hands, the men would be put off from the shift which had produced on an average the least gas per ton of coal. Such a notice was bound to give offence to the men. A few days before this notice was issued, a petition had been presented to the Directors asking for an increase of wages for the stokers. The notice was, however, withdrawn after the men had given notice to leave their work; but the advance of wages was refused. About the same time, a man by the name of Ben Davis was discharged without any notice being given to him, but he was eventually reinstated. In May, 1898, and again in September of the same year, the management tried to take advantage of the men by not allowing the senior hands to be promoted, which had been the custom long before Mr. Cawley came to manage the works. In November, 1898, another petition was presented asking for an increase of wages. Again this was refused; but the men took no action. In November, 1899, a similar petition was presented and refused, until the men gave in their notices to cease work, when an advance of 5d. per day was conceded. Your readers will therefore see that the men have been very patient during the past two years. It is true they have put down their tools on two occasions, but not without good cause.

Previous to Mr. Cawley taking charge of the works, the men never had cause to complain, because they were treated by the late Manager as men, and any grievance they may have had was always listened to. We have never objected to foremen or managers saying as to whether the men were doing their work as it should be done, but we do say that there are two sides to every question. Some gas managers want the same amount of cubic feet per ton of coals carbonized, irrespective of whether the gas is in the coals or not. Bad coals make bad coke, and this causes dull heats, so that the coals are not properly carbonized, and this means so much less gas from each ton of coals. Then the blame is thrown on the men. The tests that are made in the large gas-works of the different kinds of coal show that some is much more rich in gas than others.

The minds of the members of the Manchester Corporation have been changed since 1889, and they now deal with matters sent them through the Union, instead of ignoring them, as they formerly did. Only last week they granted some concession to some of their employees, which was applied for on the men's behalf through the Union. When the men gave in their notices in 1889, they did so according to the agreement which then existed; but the executive of the Union did not know of this till seven days afterwards. When we were made acquainted of this I went to Manchester at once, and prevailed upon the men to withdraw their notices, but when I saw the Mayor he would not accept the withdrawal. Still, we survived the defeat, and are some 10,000 members stronger than we were then.

I would here inform Mr. Cawley that at works and factories where the management treat their men as men we do not have any of these quarrels. But when you have a domineering manager or foreman, then trouble is bound to occur. Mr. Cawley does not tell your readers the causes of the disputes at the copper-works and tin-plate works. When he does, then I will answer him.

In conclusion, let me tell Mr. Cawley that, if he will show less venom towards his men, and treat them as they should be treated, he will always have our hearty co-operation in getting the men to fulfil their obligations to the Company.

The letter reminds me of the legal adage: "No case; abuse the other side." Mr. Thorne, it will be seen, does not refute any of Mr. Cawley's statements, but rather confirms some of them; and then he accuses him, first of not managing the works as the men (the Union) would like, and, secondly, of having venom towards his men. The first point is just that which is in dispute everywhere where the Union erects its head. A manager who is capable of doing his work does not require the assistance of the Union—indeed, he will not have it, because the moment he allows anyone outside to have a say in the control of the works, he abdicates his position, and becomes only joint manager. A weak man may tolerate such a state of matters; but a strong man will not. The second point grows out of the first. If a manager is weak, and gives way always when his workmen ask anything, he is, of course, in their opinion, a good man; but if he insists upon having his own way, he is put down by the Union as having venom towards his men. Now, it scarcely follows that because a manager sees fit to refuse a petition by his men, he is actuated by a desire to cut them off from earning a livelihood. Mr. Thorne would have been nearer the reality of the case if, instead of adjuring Mr. Cawley to show less venom, he had urged the men to show more regard for the interests of their employers. That, however, is not the policy of the Union. Their view is not that masters and workpeople should co-operate in bringing out the best result possible, but that there should be a position of antagonism clearly defined between them, frequently breaking out into open hostility; and with the Union officials standing between, the industries of the nation are not to be peaceful occupations, but men are to work with their fighting weapons always at hand. Their greatest enemy is always the man who gives them the employment by means of which they live. It is said that in proportion to the strength of the affection which a lunatic previously had for those about him, is the hatred which he manifests towards them after losing his reason. A Trade Union policy is thus a policy of industrial lunacy. Mr. Thorne is a poor apologist for the policy. If Mr. Cawley should consider it advisable to take any notice of Mr. Thorne's letter, he should have no trouble in showing the poverty of the reasoning in it. He will have difficulty, however, in getting hold of statements of fact, for they are very meagrely introduced.

The Falkirk Gas Commissioners had before them this week a report by the Works Committee, to the effect that a gas consumer had damaged a meter and had used a rubber pipe as a bye-pass; and that in other two instances gas-meters had been disconnected without notice having been sent to the Gas Manager. One of these two meters has been lost. Bailie Cook Rennie, who presided, said he had seen the man who had used the rubber pipe, and had arranged the matter with him on very favourable terms. The man had laid himself open to a very serious charge, had the matter been put into the hands of the police; but he did not wish to bring his name before the public. The way the incident happened was that the man had a slot meter; and being unable to get a penny inserted, he attached the rubber pipe, and used the gas through it. He had now paid for the damage to the meter, and for the gas he had used. The Commissioners approved of this policy. I doubt the wisdom of the step. If the Commissioners believed that the man took the gas in a manner which was contrary to the statute—that is, that he stole it—there was no need to deal gingerly with him. If they believed that he did the thing innocently, and he had paid for it, it was cruel to bring the matter up at a public meeting, because, although the name was suppressed, it will be known all over Falkirk by this time. Besides, in dealing with this man as they have done, the Gas Commissioners have morally given up their right to prosecute anyone who may be found doing as he did.

Weather of more than ordinary darkness continues to prevail. Last Saturday was one of the darkest days I ever remember to have seen. Lights were burning till 10 o'clock in the forenoon, and again by shortly after 2 o'clock in the afternoon. In this state of matters, gas consumption is going up all round. It is reported that at Dunfermline the output during the past month amounted to 598,900 cubic feet more than in the corresponding month of 1898—an increase equal to 5·24 per cent. At Perth, the report of Mr. A. Wilson, the Gas Engineer, submitted this week, was to the effect that there had been an increase in the output of gas during the eight months which have elapsed of 97,484,200 cubic feet—equal to 10·99 per cent. Last month was the most trying in the history of the gas undertaking, and taxed the resources of the works and staff to their utmost. By strenuous efforts, the city had been kept supplied with gas, though on four occasions, notwithstanding the reduction of pressure, when 10 o'clock at night arrived, there was only one hour's supply left. After that time, they began to gain upon the demand. Mr. Wilson considers the worst to be now passed. At Peebles, the increased output during December was 444,600 cubic feet, and since May 3,306,000 cubic feet. This is chiefly due to the liberal terms given for the introduction of gas-cookers, a policy which the Commissioners have adopted as affording an eligible investment of spare funds. At Peterhead, the Manager (Mr. G. Keillor, junr.) has reported an increased output of gas for the year to date of 12 per cent.

Mr. G. R. Hislop, Gas Engineer to the Paisley Gas Corporation, has submitted a report to that body upon the subject of stair-lighting, in which he states that the number of stairs and closes in the town lighted with gas and oil and the number without any light whatever, were as follows: Stairs lighted by gas 1198; by oil, 383; without any light, 750—total number of stairs, 2331. Mr. Hislop ventured the opinion that the example of Leith or Greenock might with advantage be adopted, wherein the periods of lighting are eight months and nine months respectively per annum, with lighting shortly after sunset and extinguishing just before sunrise. The number of gas-jets necessary to light the Paisley stairs satisfactorily was computed at 5828; and allowing 124 for each lighter employed, 47 men would be required to overtake the work of lighting and extinguishing, which would occupy about two hours morning and evening. If in Paisley lads were employed as in Leith, and reckoning on the basis of a nine months' lighting season, the charge of 10s. per light would permit of a wage of 8s. 3d. per week being paid, 10s. 3d. per light 9s. per week, or 11s. 2d. per light 12s. per week. The total annual amount payable by landlords at, say, 10s. 3d. per light, would amount to £2986 17s., of which sum the lighters at 9s. per week would receive £825, or at 12s. per week £1100, out of a total annual charge of £3253 19s. 4d. The Corporation agreed, by a majority, that the report be printed and afterwards transmitted to the Burgh Commissioners for consideration.

I have seen a report in which it is said that the Burgh Commissioners of Portsay a few months ago finally took over the acetylene-gas plant from the Manchester Acetylene and Carbide Company; that two of Frank's patent purifiers have been put in, with the result that the haze so much

complained of has almost disappeared, and the new illuminant is giving general satisfaction; and that the Commissioners have dispensed with the services of their Burgh Surveyor and Water Officer, and have appointed a Gas Manager who will perform all these duties, and devote his whole time to the work of the burgh.

The Inverness Town Council met on Monday night. The first item of business related to the extensions of the Corporation gas-works, to which I referred in October last. The Committee had been considering the proposals of Mr. Thomson, the Gas Engineer, since then; and they now recommend their adoption. Mr. J. L. Guild, the Convener of the Committee, said it had been resolved to proceed with the conversion of the second half of the retort-bench into a regenerative system, at a cost of about £2000. At the present time, the gas-works were kept going at full pressure; but the alteration would give them sufficient retort power for a long time. The condensers were unequal to the work required of them; and it was necessary that they should be replaced by new ones. The cost would be about £500; but it would be more than made up by the results which would be derived. The coal storage accommodation was too small; and it was proposed to erect a coal-shed which would give all the accommodation required. The total cost of the alterations would be about £3000. Some might ask, Mr. Guild said, why they should incur such an expense at the gas-works, in face of the introduction of electric light. But the experience of other towns where electric light had been installed was that the demand for gas increased; and he saw no reason why a similar result should not be experienced in Inverness. The fact that they were taking a larger area into the town would increase the demand for gas. The recommendations of the Committee were agreed to unanimously.

A vivid contrast to the harmonious procedure at Inverness, is to be found in a report of a meeting of the Dunbar Town Council, held on Wednesday night. It ran as follows: "Sitting as Gas Commissioners, the Board passed the gas report, which was short and satisfactory. Some points of minor importance were discussed; Bailie Smith again coming into antagonism with members of the Board. The meeting became rowdy. Members rose and left, maintaining a running discussion as they went; and at last Bailie Smith was left almost alone, protesting to the last. It was difficult to know what decisions were arrived at." All this was over questions of minor importance. What sort of scene would there be over more important matters? Bailie Smith was at one time Convener of the Gas Committee; and it must be admitted that he made a good Convener. But he does not seem to have forgiven his supercession in office.

A letter has been received by the North Berwick Burgh Commissioners from the North British Railway Company, stating that the cost of the siding accommodation at the site of the new gas-works will be £385, exclusive of works which fall to be executed by the Commissioners; and that the Commissioners must take all risks in connection with the laying of the main gas-pipe along the line of the railway, and pay £5 a year as wayleave. Another letter was submitted, from the Law Agents of the owners of Dirleton Estate, intimating that they refuse to entertain any proposal for the purchase of a new site for the gas-works unless the Commissioners (the Burgh Commissioners) complete their agreement with regard to the water to be supplied to houses on the estate. Several members expressed great disapproval of the intimation, as the water supply has nothing to do with the proposal to erect a new gas-works. Consideration of the letter was held over.

The Broughty Ferry Gas Commissioners have assented to the recommendation of a Committee to advance the wages of their gas stokers by ½d. per hour. The Troon Gas Commissioners have agreed to advance the wages of their gas stokers by 1s. per week.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 13.

Sulphate of Ammonia.—In the early part of the week, prices continued to harden; and towards the close, the advance has been very rapid—quotations being now £11 10s. to £11 12s. 6d. per ton delivered f.o.b. at the ports. The reopening of inland navigation on the Continent occasioned larger buying, to start with; but it is understood that the placing of considerable Colonial orders in London has afforded the later upward impetus. Production has been freely offered; and all parcels have been readily taken up. A large forward business has also been done, at up to £11 15s. per ton, ordinary terms, f.o.b. Leith, and £11 10s., London, Beckton terms; and higher prices are now required.

Nitrate of Soda is firm at 8s. per cwt. for refined quality on spot.

LONDON, *Jan.* 12.

Tar Products.—The apprehension that carbolic, cresylic, and picric acids would be proclaimed as contraband goods has unfortunately turned out to be too true; the Royal Proclamation having to-day been issued to this effect It remains to be seen how far it will influence the value of these articles, which are, however, very scarce, both in makers' and buyers' hands. Nineties benzol is flat; and the few buyers there are quote very low prices. For 50's, there is a little better demand; but the price of it is lower. Pitch shows a tendency to better values; and there are many buyers now who will purchase for the remainder of 1900. Freights are a little easier, and more plentiful. Solvent is firm; and creosote is steady. Anthracene is weak; and naphthalene salts are fairly firm.

The average prices obtaining during the week are: Tar, 17s. to 25s. 6d. Pitch, east coast, 34s.; west coast, 32s. Benzol, 90's, 7d.; 50's, 10d. Toluol, 90 per cent., 1s. 2d.; pure, 2s. Solvent naphtha, 1s. 4d. Crude, 30 per cent., naphtha, 4⅜d. Heavy naphtha, 1s. 2½d. Creosote, 3½d. Heavy oils, 3⅜d. Carbolic acid, 50's, 2s. 8d.; 60's, 3s. Crude naphthalene, 50s. to 55s. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia.—This market opened strong in the earlier part of the week, and has daily shown increasing firmness since. Makers are now asking £11 10s. to £11 15s., less 3½ per cent., according to port of shipment; and for forward delivery at least 5s. more will be required. A large business was done in the middle of the week at prices ranging from £11 7s. 6d. to £11 10s. f.o.b., bags included.

The Lighting Corporation, Limited, successors to the Wenham Company, intimate that, on account of the continued increase in the cost of production, all prices have been withdrawn.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 137.

Issue.	Share.	When ex-Dividend.	Dividend or Interest & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20¼—21½	−½	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	14½—15½	..	4 16 9
800,000	100	Jan. 2	5	Australian 5 p. c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd.	5¾—6¼	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid	4—4¼	..	5 6 8
880,000	Stk.	Aug. 16	12	Brentford Consolidated	273—278	..	4 6 4
270,000	,,	,,	9	Do. New	210—215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb.	124—128	..	3 2 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	250—260	..	4 8 6
226,320	,,	,,	8½	Do. A. Ord. Stk.	183—188	..	4 10 5
978,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	43¼—44¼	..	4 9 10
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c.	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c.	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9—9½	..	6 6 4
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	98—100	..	4 0 0
150,000	20	July 13	8½	Cagliari, Ltd.	28—29	..	5 13 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Oct. 13	13½	Commercial Old Stock	305—310	..	4 7 1
200,750	,,	,,	10½	Do. New do.	240—245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb.	140—145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	177—181	..	4 19 5
200,000	,,	,,	7	Do. 7 p. c. Pref.	178—183	..	3 16 6
51,600	Stk	Aug. 31	14	Croydon A 10 p. c.	335—340	..	4 2 4
168,400	,,	,,	11	Do. B 7 p. c.	265—270	..	4 1 5
555,000	Stk.	Aug. 16	5½	Crystal Palace Ord. 5 p.c.	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	July 28	11	European, Ltd.	21—22	..	5 0 0
35,960	10	,,	11	Do. £7 10s. paid	15½—16½	..	5 0 0
14,993,075	Stk.	Aug. 16	4⅛	Gas-light and Coke	4 p. c. Ord.	..	4 12 5
2,600,000	,,	,,	3½		3½ p. c. max.	..	3 10 8
3,799,735	,,	,,	4		4 p. c. Con. Pref.	..	3 5 7
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	..	3 1 3
70,000	10	Nov. 15	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental	210—215	−2	4 13 0
473,600	Stk.	Aug. 16	3½	Do. 3½ p. c. Deb. Red.	101—104	..	3 7 4
75,000	5	Dec. 14	6	Malta & Medn., Ltd.	5—5½	..	5 9 1
560,000	100	Oct. 2	5	Met. of	5 p. c. Deb.	..	4 7 9
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	..	4 2 7
541,920	20	Nov. 15	3	Monte Video, Ltd.	11—12	..	5 0 0
617,946	Stk.	Aug. 31	9½	Newc'tle & Gatesh'd Con.	220—225	..	4 2 3
264,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb.	104—107	..	3 5 5
60,000	5	Sept. 29	7	Ottoman, Ltd.	5¼—5¾	..	6 1 9

Issue.	Share.	When ex-Dividend.	Dividend or Interest & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd.	7—7¼	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼—6⅝	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
500,000	100	Dec. 1	6	People's Gas of Chicago	2nd Mtg. Bonds	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord.	10⅞—11¼	..	6 4 5
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	98—100	..	4 0 0
250,000	10	Sept. 15	10	San Paulo, Ltd.	12—13	..	7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.	249—251	..	3 19 8
209,053	,,	,,	10	Do. B.	249—251	..	3 19 8
447,427	,,	,,	10	Do. C.	249—251	..	3 19 8
5,600,000	Stk.	Aug. 16	5⅛	South Metrop., 4 p. c. Cri.	133—136	..	3 18 5
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb.	100—102*	+½	2 18 10
120,000	Stk.	Aug. 31	6	Tottenham and Edmonton	A. 5 p. c.	141—143	..	4 3 11
250,520	,,	,,	4½		B. 3½ p. c.	102—104	..	4 6 6
55,100	,,	Dec. 14	4		4 p. c. Deb.	113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.		9—10*	+½	5 0 0
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.		101—104	..	4 16 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.		307—312	+2	3 10 6
150,000	,,	,,	5	Do. 5 p. c. Pref.		157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		145—150	..	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb.		148—153	..	2 18 10
1,720,560	Stk.	Oct. 13	7	East London, Ord.		200—205	..	3 8 4
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb.		145—150	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb.		98—100	..	3 0 0
700,000	50	Dec. 14	7½	Grand Junction	10 p. c. max.	107—109	..	3 8 10
310,000	Stk.	Sept. 29	4		4 p. c. Deb.	131—136	..	2 18 10
708,000	Stk.	Aug. 16	14	Kent		348—353	..	3 19 4
160,000	,,	,,	7	Do. New, 7 p. c. max.		200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max.		292—297	..	3 10 8
406,200	100	,,	8	Do. 7½ p. c. max.		215—220	..	3 12 9
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb.		125—128	..	3 18 0
500,000	100	Aug. 16	13½	New River, New Shares		425—430	−3	3 2 9
1,000,000	Stk.	July 28	4	Do. 4 p. c. Deb.		133—138	..	2 18 0
902,300	Stk.	Dec. 14	7½	South-wark and	Ord.	202—207	..	3 12 6
126,500	100	,,	7½		7½ p. c. max.	190—195	..	3 16 11
489,200	Stk.	,,	5		5 p. c. Pref.	160—165	..	3 0 7
1,019,585	,,	Oct. 13	4	Vauxhall	4 p. c. A Deb.	131—136	..	2 18 10
1,155,066	Stk.	Dec. 14	10	West Middlesex		288—293	−2	3 8 3
200,000	,,	,,	4½	Do. 4½ p. c. Deb.		147—152	..	2 19 3
200,000	,,	Sept. 15	8	Do. 8 p. c. Deb.		100—102	..	2 18 10

*Ex div

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Notwithstanding the strong opposition among the miners in Lancashire to the continuance of the Conciliation Board on the terms which had been conditionally agreed to by the Federation officials and the representatives of the Coalowner's Association, it had been generally confidently anticipated that the Federation conference at Cardiff would honourably carry out the preliminary agreement already come to. These anticipations have been fully realized; the agreement in question, notwithstanding the instructions given by most of the Lancashire districts to their representatives to vote against it, being, according to the official report, unanimously confirmed. This decision to continue the Conciliation Board for a further period of four years from the present date, will be received with general satisfaction throughout the trade, as ensuring another settled period of freedom from wages and labour disputes, which prior to the formation of the Board so frequently caused disruption of ordinary business operations. At present, the market remains in a very unsettled and unsatisfactory condition, owing to the continued general scarcity of supplies. This, to some extent, has been due to the very indifferent way in which the men have been working in many of the Lancashire districts, as apparently they have not cared to settle down pending the result of the Cardiff conference. Collieries generally have been able to meet requirements of customers for house-fire coals out of stock; but with regard to all other descriptions of fuel, excessive difficulty has been experienced in keeping works and manufactories going from hand to mouth, while all sorts of special prices have had to be paid in the open market to secure odd lots for prompt delivery. For the moment, list rates are altogether nominal. Some extraordinary figures are reported as having been obtained for temporary supplies of gas coal—as much as 14s. 6d. to 15s. 6d. per ton at the pit. For ordinary steam and forge coals, consumers have had to pay from 12s. to 13s. per ton at the pit, and for engine fuel from 10s. 6d. to 11s. 6d.; while for shipment, 15s. has been about the average figure for steam coals, delivered at the ports on the Mersey. These prices are, of course, only temporary; and it is probable the market may, in the course of a week or so, get back into something like its normal condition. But the question of a further general upward move in prices is still being pushed forward in some quarters; and as miners are at once to receive a further advance of 5 per cent. in wages, it is not improbable that there may be some re-arrangement of list rates. As regards coke, the advance of 1s. 6d. per ton which was put on with the commencement of the month has in no way checked the pressure of orders. Manufacturers now state that there would be no difficulty in getting an advance of 2s. 6d. per ton, which some of them urged should be put on. Supplies continue short; and best foundry cokes are readily fetching about 30s. per ton at the ovens, with furnace qualities selling at 23s.

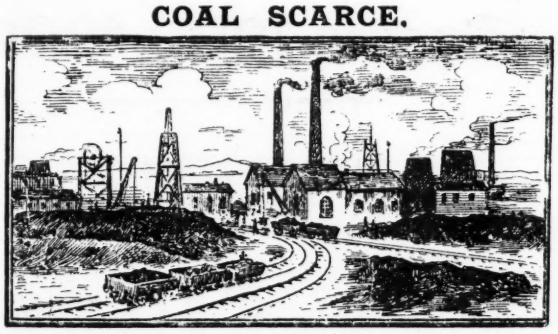
Northern Coal Trade.—The coal trade is very active; and though the output is now fuller, and has reached its normal extent, there is a demand that quite takes up the production, and that has allowed the prices of some classes of coal to advance. Best Northumbrian steam coals have risen to 18s. per ton f.o.b., and even higher prices have been quoted; while steam smalls are from 10s. to 10s. 6d. In the gas coal trade there is a demand that is still above the output; but for any extra supplies high prices are obtainable—about 18s. 6d. per ton f.o.b. being the current quotation. Some contracts are now under negotiation, and for one for export it is believed that 17s. 6d. per ton f.o.b. has been offered and accepted. It will thus be seen that the gas coal trade is extremely active; and though the quantities now being sent out are very heavy, it is probable that there will be no relief until after the end of this month. Gas coke is firm, with a strong inquiry, and with rather irregular prices for export. From 15s. to 16s. 6d. may be taken as medium quotations for f.o.b. supplies of gas coke.

Scotch Coal Trade.—The year has opened auspiciously for the coalowner. Prices have not been so high since 1873, when there was a strike. The railway companies have been charged with not providing facilities for the traffic in coal; but now the blame is being thrown upon iron and steel masters, who are said to be keeping the railway waggons. If the railway companies dared to charge demurrage, the waggon supply would soon be equal to requirements; but they are afraid to offend traders by imposing such dues. Apart from the present strained condition of the trade, the outlook appears to be good. There are numerous inquiries for shipment, at prices much below those which are current. A further advance of the miners' wages by 12½ per cent. has been agreed to by the joint board of masters and men. The prices quoted are: Main 13s. to 13s. 6d. per ton f.o.b. Glasgow, ell 14s. 6d. to 15s. 6d., and splint 14s. 6d. to 15s. The shipments for the week amounted to 76,499 tons—a decrease of 133,869 tons upon the previous week, but an increase of 15,173 tons upon the first week of last year.

St. Petersburg Water Supply.—The question of supplying St. Petersburg with water from Lake Ladoga was raised lately at a sitting of the Municipal Council. As the city lies only 40 miles west of the lake, it ought not to be a very difficult or costly work to lay the necessary water-pipes along the almost level banks of the Neva.

Eighty Years' Purchase for Land Forming a Watershed.—It appears from an inquiry made by Mr. Worth at the meeting of the Darwen Town Council on Monday last week, that a big price is going to be paid by the Corporation for the land forming the watershed area. The councillor asked whether it was true the price would be equal to 80 years' purchase; and Mr. Tomlinson referred to it as a "grievous burden" on the town. The Town Clerk said the price to be paid was that agreed upon. They must be perfectly fair and just to everybody; and it was quite open to the Corporation to have gone to arbitration. It did not seem right that the ratepayers should be led to believe that they had made a bad bargain; for he believed that the town had saved money by making this agreement. The statement was received with laughter.

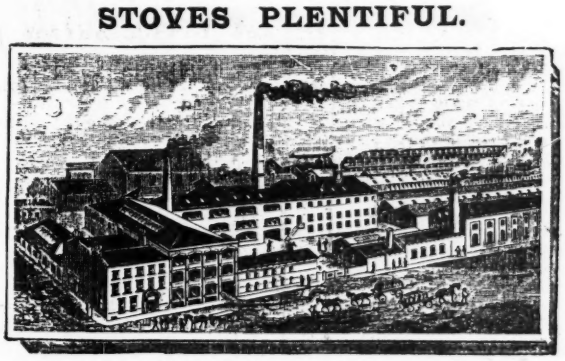
COAL SCARCE.



There is a tide in the affairs of men (and Gas Companies), which, taken at the flood, leads on to fortune.

Julius Cæsar IV., 3.

STOVES PLENTIFUL.



N.B.—Perhaps the Reader will supply the Advertisers' Name.

Large Gas and Water Consumptions in Liverpool.—In the week ending the 30th ult., the gas consumption in Liverpool was 122 million cubic feet; the quantity of water sent out in the same week being 216½ millions, or about 37½ gallons per head of the population—the highest figures on record for the city.

Tuxford Gas-Works Flooded.—Very heavy rain has fallen in North Notts, and in several places the River Idle overflowed its banks, and other water courses flooded the land. At Tuxford the gas-works were flooded to such a depth last Sunday week that the fires were put out and the inhabitants had to resort to other means of lighting.

Advance in the Price of Fire-Bricks, &c.—The manufacturers engaged in the fire-clay trade of the Staffordshire and Worcestershire district have advised their customers of a general advance of prices. Fire-bricks are increased 5s. per 1000; fire-clay, 1s. per ton; gas-retorts, 6d. per foot; blast-furnace bricks, 5s. per ton; and all other fire-clay goods, 10 per cent.

Clacton Gas and Water-Works Purchase.—At the meeting of the Clacton District Council last Wednesday, a letter was received from the Public Works Loan Board, agreeing to advance £100,000, required by the Council for the purchase of the gas and water undertakings—at 3 per cent. for £46,250 (to be repaid in 40 years), and at 3¼ per cent. for £53,750 (to be repaid in 50 years). The tender of Messrs. S. Cutler and Sons, amounting to £2450 for the supply of a new gasholder, was accepted. It was stated that the present holders were totally inadequate to meet the demand.

Wages and Gas Consumption at Heywood.—In the minutes which the Gas Committee presented to the Heywood Town Council last Thursday, it was reported that it had been resolved that the wages of the gas stokers should be increased 3d. per shift; that the wages of the labourers be advanced ¼d. per hour; and that the wages of the meter inspectors be increased 1s. per week. In moving the adoption of the minutes, Mr. Firth stated that December had been the heaviest month they had ever had for gas consumption. The consumption was 20,200,000 cubic feet, against a total of 18,483,000 feet for the corresponding month. The minutes were approved.

The Warwick Rural District Council and the North Warwickshire Water Bill.—At the last monthly meeting of the Warwick Rural District Council, it was reported that the General Purposes Committee, in conjunction with the district councillors for the parishes affected by the North Warwickshire Water Bill, had met, and reported that they had considered the scheme of the Bill, which included the parishes of Stoneleigh, Baginton, Bubbenhall, Weston, Wappenbury, Eathorpe, Cubbington, Hunningham, and Offchurch, within its area of supply, and proposed to sink wells at Stoneleigh for the supply of water for the parishes. The Committee recommended that the Council should object to power being given to private companies for the execution of works which they themselves were prepared to carry out when necessary. The Committee instructed the Clerk (Mr. C. H. Passman) to lay before the Local Government Board and the Warwickshire County Council details and particulars of their objections to the scheme.

Southport Corporation and the Water-Works.—The Southport Corporation have resolved to oppose the Bill which the Water Company are promoting in the forthcoming session of Parliament. Within the last few weeks, it may be stated, the Corporation have approached the Water Company, asking if the Directors were willing to discuss the question of the purchase of the undertaking; and the Directors have declined.

Bewdley Water Scheme.—The Bewdley Town Council have resolved to ask the sanction of the Local Government Board to the borrowing of £12,000 for carrying out a scheme of water supply. It is the work of Mr. R. E. W. Berrington, of Wolverhampton; and it involves pumping the water from a well at Blackstone to a reservoir at Mount Pleasant, thence by gravitation; a second pumping-station and reservoir being necessary for supplying Long Bank.

The Control of Watershed Areas.—The condition of the law as affecting sources of water supply which are becoming necessary for local consumption was recently discussed by the Water Committee of the Cardiff Corporation. The subject was brought forward in a circular-letter received from the County Councils Association; and Mr. C. H. Priestley, the Water Engineer, commenting upon the matter, pointed out that great injustice was being done in some parts of the country by the abstraction of the water naturally belonging to the inhabitants, and said some provision seemed necessary to check and prevent its appropriation in future. Resolutions were adopted favouring the protection of rural districts and the establishment of Joint Water Boards.

Benefits of Filtering Water.—The beneficial effect of water filtration upon the typhoid death-rate of a community afflicted with polluted water is strikingly shown by figures given in the report of the Massachusetts State Board of Health for 1898. From 1887 to 1892 inclusive, the number of deaths from typhoid in the City of Lawrence ranged from 47 to 60 per annum—a rate per 10,000 of population of 11·44 to 13·44. The filter plant was put in operation in the latter part of 1893, and the typhoid deaths for that year fell to a total of 39 and a rate of 7·96 per 10,000. In 1894, the first full year the filter was in service, the deaths were 24, and the rate 4·75 per 10,000. There has been a steady diminution since, until in 1898 there were but eight deaths from typhoid fever in the city; giving a rate of 1·39 per 10,000 of population.

County Councils and Water Supply Questions.—The following resolution passed by the Devon County Council has been circulated among similar bodies: "That this Council press on the Local Government Board the necessity of introducing into Parliament without delay, a Bill investing District Councils with the necessary powers for obtaining water compulsory where it cannot otherwise be obtained at a reasonable cost, and that this resolution be forwarded to other County Councils, inviting their co-operation." The Sanitary Committee of the West Riding County Council are considering the resolution passed at the last meeting of the British Association of Water-Works Engineers relative to the control of water-supply sources, with a view to definite and practical proposals on the question being laid down. The Committee are of opinion that the matter is of great importance.

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Season 1899-1900.

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Gas Companies' Opposition to the Bradford Corporation Bill.—At a meeting of the Directors of the Airedale Gas Company, the Eccleshill Gas Company, the North Bierley Gas Company, and the Clayton, Allerton, and Thornton Gas Company, yesterday week, the gas purchase clauses of the Bradford Corporation Bill were discussed. It was decided to offer strenuous opposition to the Bill, and to engage Counsel for the purpose.

Fatal Gas Poisoning Case at Heckmondwike.—Mr. P. P. Maitland held an inquest at Heckmondwike yesterday week, on the body of William Senior, aged 76, a retired cloth weaver. It appeared that deceased, who was a widower, resided alone; and on the previous Tuesday he was not seen about as usual. On the door of his residence being burst open, he was found in bed in an unconscious state; the room being full of gas. It was found that the gas-tap was open; deceased having apparently turned it too far, in putting out the light. He lingered until Saturday night, being practically unconscious all the time. A verdict of "Accidentally poisoned by gas" was returned.

Proposed Adoption of Water Gas at Oldham.—At the close of a recent meeting of the Gas Committee of the Oldham Corporation, Alderman Harrop mentioned that, when last the question of the adoption of water gas in Oldham was considered, he opposed it on the ground that the proposal was inopportune. Seeing, however, that coal had reached a very high price, and might eventually go higher, he thought it time that the Committee began to consider their position in reference to the matter. He suggested that the Chairman (Mr. Letham) and the Engineer (Mr. J. Chadwick) should look into the matter. The Chairman said water-gas plant would certainly help them in times when they were hard pressed. He noticed that Belfast would not have been able to cope with the recent great demand for gas had it not been for the assistance rendered by the water-gas plant. The matter was left in the hands of the Chairman and the Engineer.

Shortage of Gas at Southport.—Southport, like other places, suffered lately from a short supply of gas; not, however, owing to the scarcity of coal, but to lack of oil. At the meeting of the Town Council last Wednesday, Dr. Isherwood, the Chairman of the Gas Committee, offered some explanation of the matter. He said the last time they ran short of gas was four years ago, and they determined then that they would have a water-gas plant, which could be brought into action in a very short time. They obtained the plant; but, unfortunately, when they were most anxious to use it, they ran short of material necessary for its utilization. A tank of oil which should have arrived on a certain day was sent off without directions. Their Gas Manager (Mr. J. Booth) became very uneasy on account of its non-arrival; but he fully expected it the next day. As it did not come, he went off to Liverpool, and ran about from place to place, and at last found the tank of oil in a siding at Aintree, undirected. That missing tank accounted for everything. When the Manager found it, he asked for a special engine to be put in, and the tank reached Southport on the day that the complaints began to come in thick and fast. He thought, notwithstanding what had been said in the town, the gas supplied by the Corporation had been both plentiful and good.

Proposed Extension of the Wantage Gas-Works.—The quantity of gas consumed at Wantage last year was nearly a million cubic feet more than it was in 1897; and though the whole of the retorts were kept at work the week before Christmas, the demand for gas was so great that it could not be properly met. It is intended to enlarge the works; and plans are being prepared for presentation at the next meeting of the District Council.

Record Gas Consumption at Croydon.—Notwithstanding the competition of the electric light at Croydon, the Gas Company's sales last month exceeded anything reached before the introduction of the newer illuminant. On Saturday, the 23rd, the output was a "record" one—being within a few thousands of 4 million cubic feet. The sales for the month were 20 per cent. higher than those for December, 1898; the increase over the entire year being 9·4 per cent.

Ripon Corporation Gas Supply.—At the last monthly meeting of the Ripon Corporation Gas Committee, the Manager (Mr. E. E. J. Anderson) reported that, although the past month had been one of great anxiety to nearly every gas manager, on account of the difficulty experienced in getting coals, he had fortunately an ample supply, though, to prevent a collapse, he was compelled to get outside help. He asked for additional storage, as he had barely room for a fortnight's stock of coal, whereas he should have space for twice this quantity. The make of gas in December was 5,417,000 cubic feet, as compared with 4,322,900 cubic feet in December, 1898; being an increase at the rate of 5 per cent. The gas made from March 25 last to Jan. 1 this year was 28,262,000 cubic feet; in 1898, 23,654,900 cubic feet; and in 1896, 21,850,300 cubic feet—being an increase over 1898 of 4,607,100 cubic feet and over 1896 of 6,411,700 cubic feet, or more gas than was made altogether in nine months of the year 1879. The total cost of manufacture last year showed a slight decrease as compared with 1898.

Gas Poisoning Fatalities in Belfast.—The Belfast Coroner (Mr. E. S. Finnigan) recently held an inquest on the body of Sarah Houston, who died at 32, St. Kilda Street. The evidence showed that the deceased had been on a visit from Cookstown to her aunt. Her uncle, Joseph Brisbane, who works out at night, on returning home on the morning of the 3rd inst. found the gas escaping in the kitchen. On going upstairs, he found the deceased lying in bed unconscious. Medical assistance was procured; but she did not regain consciousness, and died on the morning of the 4th. Deceased had been left to turn off the gas before retiring. The Jury returned a verdict to the effect that death was due to gas poisoning, in accordance with the medical evidence; no blame being attributable to anyone. A rider was attached, requesting the Coroner to call the attention of the Gas Committee of the Corporation to the number of deaths from gas poisoning that have occurred since the introduction of water gas, in the hope that they will take steps to minimize as far as possible the amount of carbon monoxide in the gas. It has since transpired that Mrs. Brisbane, the aunt of the deceased, has died. She was also affected by the escape, and the excessive vomiting that followed brought on premature childbirth; and both the mother and child eventually succumbed.

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WINTER SEASON 1899-1900.

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Reduction in Price.—At the meeting of the Matlock District Council on Monday last week, a notification of a reduction in the price of gas of 2d. per 1000 cubic feet was received from the Gas Company, to whom a vote of thanks was passed.

The Southampton Corporation and their Protective Areas Bill.—At a special meeting of the Southampton Town Council held last Wednesday, a motion submitted by the Mayor (Alderman G. A. E. Hussey) to proceed with the Bill for empowering the Corporation, among other things, to purchase land to protect their sources of water, was rejected, owing to the requisite majority of the Council not being obtained. There were 24 votes in its favour, and 27 were necessary.

The Sevenoaks Water Company's Provisional Order to be Opposed.—At the last meeting of the Sevenoaks Urban District Council, the Committee appointed to consider the proposal of the Sevenoaks Water-Works Company to apply for power to raise additional capital made the following recommendations: (1) That the necessary steps be taken to represent to the Board of Trade that the 7½ per cent. limit on the rateable value of property, now charged by the Company for the supply of water, be reduced to 6 per cent. (2) That the necessary steps be taken to obtain the insertion in the Provisional Order of a clause enabling the Council to acquire compulsorily, at such time as might be deemed advisable and at a fair and equitable price, the undertaking of the Company. (3) That as soon as a copy of the draft Provisional Order was obtained, the amount of new capital asked for be carefully considered by the Council, with a view to making such representations to the Board of Trade as the Council might deem advisable. The report was adopted.

The Financial Position of the Cowlyd Water Board.—The Conway and Colwyn Bay Joint Water Supply Board have for a long time been endeavouring to obtain the sanction of the Local Government Board to the borrowing of a sum of £30,000 for the purposes of their undertaking. Impatient at the delay which has taken place, the Joint Board have carried out a considerable portion of the works in respect of which the loan was applied for. This proceeding has just received a severe setback from the Superior Board, who have imposed on the managers of the Joint Board a penalty as a punishment for spending money before obtaining sanction to borrow it. In a letter recently received by the Clerk to the Cowlyd Board, the Superior Board point out that the loan already sanctioned has been exceeded in expenditure by £13,457, and that in this sum is included money, the borrowing of which they were not prepared to sanction. Further, the total expenditure included law and other costs. Before coming to a decision on this portion of the application, the Board require tax bills of the law costs, and vouchers for the other bills. But as the works have already been carried out, the Board, in accordance with their usual practice, have decided to deduct from the amount they are inclined to grant the equivalent to the sum which would by now have been repaid had the loan been sanctioned and raised at the time the works were executed. The fine imposed on the Cowlyd Board for undertaking works before receiving the sanction of the Superior Board amounts to £2097. The total sum sanctioned is £14,591.

Additional Storage at the Colwyn Bay Gas-Works.—The Colwyn Bay and District Gas Company's consumption continues to increase at a rapid rate. This has made it necessary to add considerably to the existing gasholder capacity. Tenders were invited for an 80-feet telescopic gasholder and steel tank, and that of Messrs. R. Dempster and Sons, Limited, of Elland, has been accepted. The work is to be carried out under supervision by the Company's Engineer, Mr. J. C. Pennington.

Proposed Extension of the Smethwick Gas-Works.—At the last meeting of the Smethwick Town Council, the Gas Committee recommended that the Town Clerk (Mr. W. Shakespeare) should be instructed to take the necessary steps for enabling the Committee to borrow the remaining £13,000 authorized by the Provisional Order of 1893, and also for obtaining another Order sanctioning the borrowing of a further sum of £50,000 to carry out the railway siding scheme, extend the manufacturing and distributing plant, and make other improvements which may become necessary.

Gas-Engine Explosion in Glasgow.—On the afternoon of Thursday last, an explosion took place in connection with a gas-engine at the works of Messrs. Murray, M'Minnie, and Co., brassfinishers, Glasgow. Two men—John Livery and Donald Macmillan—were starting the engine, when shortly after they had ignited the gas an explosion occurred, scattering the fly-wheel and different parts of the engine to a distance of 14 feet, and rendering the men unconscious. After receiving medical attention, they recovered, and were able to go home. The gas is supposed to have accumulated under the bed-plate of the engine.

Derwent Valley Water Board.—A meeting of this Board was held at Sheffield last Thursday. Most of the business transacted was of a formal character. The Clerk was instructed to obtain the insertion of a clause in the Rotherham Corporation Bill of this year for the protection of the interests of the Board, and was also requested to keep a record of all matters relating to water supply in the area to be supplied by the Board. Messrs. Crowther, of Huddersfield, were appointed the surveyors to take the levels and make the necessary surveys of the sites for the Ronksley and Howden reservoirs in the Derwent Valley. It was also resolved to hold the meetings of the Board at Derby, Leicester, Nottingham, and Sheffield, in rotation, on the last Thursday in each month, till further notice.

Suffocation by Gas.—A distressing accident was discovered at Tunstall last Saturday. On Friday evening the neighbours in a house next door to that occupied by a Mrs. Vernon and her daughter detected a strong smell of gas. Three persons in the house were taken ill. The neighbours on the other side of Mrs. Vernon also noticed the smell; and two people there were taken ill. It was observed on Saturday that Mrs. Vernon's house remained shut. She had said she was going to a relative's at Longton; but, inquiry there showing she had not arrived, her house was broken into. Mrs. Vernon was then found in the kitchen dead, suffocated by gas. Her daughter was upon a sofa, almost suffocated, and she died on Sunday. A steam roller had been used on the road; and it is supposed that the leakage of gas was caused by the fracture of a main.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000

And Additional Work, including complete Gas-Works at Nelson and Rossland, British Columbia.

The Ventnor District Council have been informed that the local Gas and Water Company are not disposed to sell the water portion of their undertaking.

The contract for the whole of the cooking apparatus for the large new Hotel Majestic at Harrogate, at present being built for the Fredericks Hotel Company, has been secured by Messrs. R. & A. Main, Limited, of Glasgow and London.

Messrs. G. Pettigrew and Co., of Middlesbrough, have received orders to erect complete their newest type of sulphate of ammonia plant at the Dunfermline Gas-Works; and similar plant, with their most improved tar-distilling plant, at the Peterhead Gas-Works.

We have received one of the pocket monthly diaries issued by Messrs. Donald Macpherson and Co., Limited, of the Manchester Colour Works. It contains a number of tables which managers may find useful for reference, and a not less useful insurance coupon for £500, which covesr accidents when cycling.

The New Conveyor Company have booked contracts for the plant for 20 beds of inclined retorts at Bremen, 25 beds and a coal-store for Melbourne, the whole of the work for the new retort-house and coal-stores at Blackburn, and complete coke-handling and storage plants for Tottenham and Blackburn.

Messrs. W. Sugg and Co., Limited, have sent us a copy of their "Gas Engineer's Pocket Almanack and Lighting Table for 1900." It contains, as in former years, ruled pages for entering carbonizing and gas accounts, a number of useful tables, illustrated descriptions of the firm's photometers and other specialities, and a diary.

The estimates presented at a recent meeting of the Dover Corporation showed that the water-works had yielded a profit of no less than £3500 on the year. This, together with a profit of £2000 on the electric trams, is equal to a reduction of 1s. in the pound on the town's rates. The water is supplied at the rate of 10s. per annum per house of £20 rateable value.

We have received Messrs. Richmond and Co.'s blotter and diary for 1900. The form has been altered from previous years; the blotter being now made to fold, with a fortnightly calendar occupying the left-hand half. It is accompanied by their pamphlet furnishing special statistics on slot cookers, and a map showing the distribution of these useful appliances over the British Isles.

Mr. Percy Griffith, the Consulting Engineer to the Gainsborough District Council, has presented to that body a revised estimate for a new or second boring in connection with the water-works, which, exclusive of boring cost, is: Engine-house and foundations £2250, travelling-crane £300, pumping machinery £5000, Engineers' commission and expenses £300, legal expenses and contingencies £550—total, £8400. For providing lifting tackle for the pump-rods in the old artesian boring, the Council have accepted a tender amounting to £1189.

The Acetylene Light Syndicate, Limited, of Trowbridge, recently gave a display of acetylene gas lighting and apparatus in the Corn Exchange, Hungerford. The large hall was illuminated with 12 burners, each of 50-candle power, 10 of which were fitted to the permanent pendants suspended from the roof; the coal gas having been disconnected, and acetylene laid on in the same way. The clock tower was illuminated with 400-candle power, by simply removing the ordinary gas-burners and replacing them by burners suitable for acetylene gas.

The Newcastle and Gateshead Gas Company have decided to extend the system of stoking machinery in their Redheugh works, and have placed a contract with West's Gas Improvement Company, Limited, for the fitting up of their No. 3 retort-house with their stoking machinery, similar to that which the same firm erected in 1898 in their No. 4 house, which was started last year. The contract includes two compressed air charging and drawing machines, four coal-breakers and engines, four elevators, four large hoppers, and all neceessary structural iron-work.

A report presented to the Falmouth Town Council, at their monthly meeting last Thursday evening, expressed gratification at the fact that the Water Company are taking steps to improve the quality and quantity of the supply. Mr. Cox, the Manager of the works, wrote that he had received authority to double the area of the filter-beds, and had already received 100 tons of the necessary sand and the perforated pipes, and the work would be carried out as soon as possible. The Water Purchase Committee recommended that maps be obtained showing the reservoirs and the streams running thereto, and that a Sub-Committee be appointed to confer with the Penryn Corporation on the subject.

The annual dinner given to the employees at the Ripon Gas-Works by the Manager (Mr. E. E. J. Anderson) and Mrs. Anderson took place a few evenings ago at the Black Bull Hotel, Ripon. Among those present was the Mayor (Mr. Wilkinson). After dinner, the host and hostess wished their guests a Happy and Prosperous New Year; and the former gave some particulars as to the progress of the works during the past twenty years, in which period the make of gas had, he said, risen from 8 to 39 million cubic feet. The Mayor expressed his pleasure at seeing the kindly feeling existing between the Manager and the men, and said he hoped that it would long continue. After the loyal toasts had been honoured, "The Health of Mr. and Mrs. Anderson" was cordially drunk.

The perfection to which letter-press printing has been brought of late years is well exemplified in the new edition of Messrs. W. Parkinson and Co.'s general trade catalogue, a copy of which has been sent to us. It opens with views of the three branches of the firm in London and Birmingham. These are followed by illustrations and particulars of their various kinds of meters, with *facsimiles* of testimonials as to the working of their station meters. They have given special attention to the perfection of their prepayment meters, which are now being largely adopted. The next section of the catalogue is devoted to station governors; an illustration being given of the firm's method of employing water pressure instead of weights, if preferred. The rest of the catalogue consists of illustrations of experimental meters and other apparatus, gauges, water-meters, regulators, lighting torches, street-lamps, &c. Only four pages are given to gas cooking-stoves and gas-fires, as the various kinds manufactured by the firm are shown in a special catalogue. The book is neatly bound, and makes a really handsome volume.

C. & W. WALKER, Ltd.

Midland Iron-Works, DONNINGTON,
Near NEWPORT,
SHROPSHIRE.

110, CANNON ST.
LONDON, E.C.

Telegraphic Addresses:
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VALVES.
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Weck's Patent Centre-Valve for Four Purifiers.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
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ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

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Offices: Commercial Buildings, LEEDS. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, See Jan. 2, p. 2.]

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.

Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

BENZOL, specially made for the Enrich- ment of Gas.

ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

ENRICH your Gas with cheap Benzol. Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER AND CO., MIDDLESBROUGH.

GAS TAR wanted.

BROTHERTON AND CO, Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PRACTICAL RETORT SETTERS.

BATES & NUTTALL, 32, Havelock Road, Saltley, Birmingham.

Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

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BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

ADVERTISER (age 26) desires appoint- ment as CLERK or COLLECTOR with Gas Company. Well acquainted with Gas Office Routine, Accounts, Correspondence, &c. Good writer, knowledge of Shorthand, Gas-Fitting, and Meters. Highest References.

Address No. 3410, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN wanted, conversant with Chemical and Gas Plant.

State Age, Experience, and Salary to C. & W. WALKER, LIMITED, Donnington, near Newport, SHROPSHIRE.

ENGINEERING Draughtsman required. State Age, Experience, and Salary required, to SAMUEL CUTLER & SONS, Engineers, Millwall, LONDON.

Messrs. Cutler & Sons have also VACANCIES for well-trained JUNIORS.

GAS-FITTER wanted. Used to In- dexing, Prepayment Meters and Fittings, Mains, Services, able to do light Blacksmithing, and having a little knowledge of Gas Manufacture.

Apply to the SECRETARY, Gas Company, Queenstown, Co. CORK.

WANTED, for a Small Gas-Works, a GAS MAKER who can do light Repairs, Service Laying, and Meter Taking or Fixing. Wages 25s. per week, with House, Coal, and Gas free.

Applications, with recent Testimonials, to be sent to No. 3413, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS EXAMINER.

THE Town Council of Gravesend being desirous of appointing a GAS EXAMINER under the Gas-Works Clauses Act, 1871, section 29, and the Local Gas Acts, to test Illuminating Power, Purity, and Pressure, invite Applications.

Terms and Testimonials to be sent to CHAS. E. HATTEN, Town Clerk, GRAVESEND.

WANTED, by the Aldershot Gas and Water Company, a smart Young Man as ASSISTANT INSPECTOR and COLLECTOR on Ordinary and Automatic Meters. Wages 20s. to 25s. per week.

Applications, stating Age, Qualifications, &c., should be sent in not later than Thursday, the 25th inst., addressed to the SECRETARY of the Company.

HORSHAM GAS COMPANY, LIMITED.

WANTED, a competent and steady Man as STOKER, used to Shovel Charging and Exhauster. One with a knowledge of Carburetted Water-Gas Plant preferred.

Apply, at once, with References, Age, &c., to
E. D. SAPEY,
Manager.
Jan. 6, 1900.

MERTHYR TYDFIL GAS COMPANY.

WANTED, a competent young Man as INSPECTOR of METERS and ASSISTANT CLERK in the Gas-Fittings Department. Wages 25s. per week.

Applications, in own Handwriting, stating Age, where last employed, and enclosing *copies* only of Three recent Testimonials as to Character and Experience, to be addressed to the undersigned not later than Saturday, the 20th inst.

JOHN L. COCKER,
Secretary and General Manager.
Gas Office and Works, Merthyr Tydfil,
Glamorganshire, Jan. 2, 1900.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

WANTED, a Working Manager for a small Gas-Works, situated in the Midland Counties, making from 14 to 15 million cubic feet per annum. House, Fuel, and Gas provided.

Apply, by letter, in own Handwriting, stating Wages required, Age, with not more than three Testimonials, also time when duties can be commenced, to No. 3412, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Provincial Gas Com- pany in the South of England, an ASSISTANT GAS ENGINEER and MANAGER. One who has had experience with Regenerative Retort-Settings, Carburetted Water-Gas Plant, and Sulphur Purification preferred.

Apply, by letter (not later than the 17th inst.), stating Age, Experience, and Salary required, and endorsed "Application," to Messrs. LASS, WOOD, & DREW, 30, Gracechurch Street, LONDON, E.C.

BROMLEY GAS CONSUMERS' COMPANY.

OUTDOOR SUPERINTENDENT OR FOREMAN.

WANTED, at once, a smart, active Man, of good address, who thoroughly understands Main and Service Laying, Meter and Stove Fixing, and General Gas-Fitting.

State Age, Experience, Salary expected, and send *copies* of three Testimonials, to
WILLIAM WOODWARD,
Engineer.
Offices and Works: Bromley,
Kent, January, 1900.

FARNWORTH AND KEARSLEY GAS COMPANY.

ASSISTANT MANAGER.

THE Directors invite Applications for the position of ASSISTANT GAS MANAGER. Salary, £125 per annum.

Applications, stating Age, Experience, and enclosing not more than two recent Testimonials, to be addressed to the Chairman of the Company, endorsed "Assistant," and to be delivered on or before Saturday, the 20th inst.

By order,
T. L. SHEPPARD,
Manager.
Gas Offices, Farnworth,
Jan. 3, 1900.

BOROUGH OF MACCLESFIELD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive APPLICATIONS for the position of ENGINEER and MANAGER of their Gas-Works. Candidates must possess a thorough knowledge of the Manufacture and Distribution of Gas on the most modern principles. The person appointed to devote the whole of his time to the Duties, and be able to design and carry out Alterations and Extensions of Plant. Age not to exceed 40 Years. Salary to commence at £250 per annum.

Applications, in Candidates' own Handwriting, accompanied by three recent Testimonials, and addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, to be delivered not later than Monday, Jan. 22, 1900.

DUNDALK GAS COMPANY.

WANTED, at once, by the Directors of this Company, an experienced and competent GAS MANAGER, to take immediate charge of their Works. (Annual make 35 millions.) He must have a practical knowledge of the Manufacture of Coal Gas, Carburetted Water Gas, Sulphate of Ammonia, and the laying of Mains and Services, upon the most approved modern systems, and have the entire control of the same.

Salary £150 per annum, Residence, Rates, Coal, and Gas free.

Applications, in Candidates' own Handwriting, accompanied by three Testimonials of recent date, to be sent to the Secretary, Dundalk Gas Company, not later than the 20th of January, 1900.

JOSEPH A. COULTER,
Secretary.

WANTED, a Stoker. Constant Employment. Seven Days.
Apply, stating Wages required, Age, and Reference, to the MANAGER, the Crays Gas Company, St. Mary Cray, KENT.

WANTED, by a large Gas Company in the South of England, good GAS-FITTERS, able to fix Meters and do high-class Internal Fitting. Permanent Situations.
Apply, stating wages, to No. 3409, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.
(WATER DEPARTMENT.)

THE Water Committee invite Applications from experienced Men for the post of SUPERINTENDENT WASTE INSPECTOR.
Applications, in own Handwriting, giving full Particulars of Age, &c., and enclosing *copies* of two recent Testimonials, must reach me not later than Friday, the 26th inst.

E. ANTONY LEES,
Secretary.

44, Broad Street, Birmingham,
Jan. 13, 1900.

CITY OF BIRMINGHAM.
(WATER DEPARTMENT.)

THE Water Committee are prepared to receive TENDERS for DISCARDED MACHINERY, &c., lying at Aston and Longbridge Pumping-Stations.
The Committee do not bind themselves to accept the highest or any Tender.
Tenders must be made on the Forms provided, and must be delivered at these Offices not later than Twelve o'clock noon on Friday, the 26th inst.
Forms of Tender, and Cards to View, can be obtained on application to

E. ANTONY LEES,
Secretary.

44, Broad Street, Birmingham,
Jan. 13, 1900.

IRON ROOF for Sale, 78 feet long by 53 ft. 4 in. Span, in first-class condition.
Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

ENGINES and Exhausters, from 3500 to 30,000 cubic feet per hour, in Stock, ready for delivery. No reasonable offer refused.
J. F. BLAKELEY, Thornhill, DEWSBURY.

LIVESEY Washer, 1 Million per diem, 18-inch Valves. MORRIS & CUTLER'S CONDENSER, 18-inch Valves. All in perfect order, and cheap.
J. F. BLAKELEY, Thornhill, DEWSBURY.

RETORT IRONWORK.

RIVETED Wrought-Iron U Hydraulic MAINS, with 5-inch Pipes, 20 in. by 15 in., and 21 in. by 15 in. ∩ MOUTHPIECES, in sets of six and seven, complete. Equal to new, and cheap.
J. F. BLAKELEY, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

MANSFIELD CORPORATION.
(GAS DEPARTMENT.)

FOR SALE—Four 15 feet Square PURIFIERS, with 12-inch Connections, Centre-Valve, and Lifting Gear, all complete, and in good working order. Being replaced with larger ones.
For further Particulars, apply to

ARTHUR GRAHAM,
Engineer and Manager.

TENBY GAS CONSUMERS' COMPANY, LIMITED.

THE above Company have the following PURIFYING PLANT for immediate Sale:—
Four 6 feet square PURIFIERS (in pairs), with 6-inch Centre-Valve and Connections to same.
Two 5 feet square CHECK BOXES, fitted with two 6-inch Four-Way Valves and Connections to same.
Also LIFTING GEAR.
Address ALFRED H. BROOKMAN, Engineer and Manager, Gas-Works, TENBY.

EDINBURGH AND LEITH CORPORATIONS GAS.

THE Gas Commissioners are prepared to receive TENDERS for the supply of GAS EXHAUSTERS and MECHANICAL ACCESSORIES for the equipment of a Station at the new Gas-Works at Granton, for the propulsion of Gas to the District Storage Stations.
Specification and Form of Tender can be obtained on application to the Chief Engineer, Mr. W. R. Herring, Edinburgh, on or after the 17th inst.
Tenders are to be addressed to the undersigned, and delivered at 25, Waterloo Place, on or before Ten a.m., on the 12th of February, 1900.
The Commissioners do not bind themselves to accept the lowest or any offer, and reserve to themselves the right of accepting the whole or any portion of the Appliances tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place,
Edinburgh, Jan. 12, 1900.

COUNTY BOROUGH OF BLACKBURN.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to accept OFFERS for the under-mentioned PLANT—
Six PURIFIERS, 25 feet square, 5 feet deep, complete with one Four-Way Dry-Faced Centre-Valve, and one Two-Way Dry-Faced Centre-Valve, Syphons, and 14-inch Connections. Erected in 1882 by Messrs. C. & W. Walker.
Two STATION METERS, 30,000 cubic feet per hour each, erected in 1882 by the Gas-Meter Company, Limited.
Two ROTARY EXHAUSTERS, 30,000 cubic feet per hour each, erected in 1882 by Messrs. Bryan Donkin and Co.
Complete Set of RETORT MOUNTINGS for seven Beds of Through Retorts, seven in a Bed, including separate Hydraulic Main for each Bed, Foul Main, Tar-Pipes, Dip-Pipes, Ascension-Pipes, Mouthpieces, 20 in. by 16 in., &c.
The whole of the above can be seen on application at No. 1. Gas-Works, and any further Information obtained from the undersigned.

S. R. OGDEN,
Gas Engineer.

Municipal Offices,
Blackburn.

THE Ludlow Union Gas Company are prepared to receive TENDERS for Two New PURIFIERS, 12 ft. by 12 ft. by 4 ft. 6 in. deep; and one SIX-WAY CENTRE-VALVE, to work three Boxes. Also one FOUR-WAY VALVE for working one Box on or off, with 8-inch Connections, and fixing the same ready for connecting up.
The Company do not bind themselves to accept the lowest or any Tender.
For further Information and Particulars, apply to Mr. W. H. Whitehouse, Manager at the Works.
Tenders to be sent in to the undersigned on or before the 22nd of February, 1900.

J. W. MONTFORD,
Secretary.

Ludlow Union Gas Company,
Ludlow, Shropshire, Jan. 10, 1900.

THE Ludlow Union Gas Company are prepared to receive TENDERS for the CONVERSION of an existing ONE-LIFT GASHOLDER into a TELESCOPIC GASHOLDER of about 40,000 Cubic Feet Capacity in a Tank about 41 ft. 6 in. diameter.
The Company do not bind themselves to accept the lowest or any Tender.
For further Information and Particulars, apply to Mr. W. H. Whitehouse, Manager at the Works.
Tenders to be sent in to the undersigned on or before the 22nd of February, 1900.

J. W. MONTFORD,
Secretary.

Ludlow Union Gas Company,
Ludlow, Shropshire, Jan 10, 1900.

DARWEN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR CONVERTING GASHOLDER.

THE Gas Committee of the Darwen Corporation are prepared to receive TENDERS for CONVERTING an existing 100 feet diameter TWO-LIFT into a FOUR-LIFT GASHOLDER.
Copies of Specification and Form of Tender may be obtained, and Plans seen, at the Office of Mr. A. H. Smith, Engineer and Manager, Gas-Works, Charles Street, Darwen, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Gasholder," to be delivered to the undersigned on or before Noon, the 29th inst.
The lowest or any Tender not necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Office, Darwen,
Jan. 10, 1900.

THE CORPORATION OF WOKINGHAM.

TO GASHOLDER MAKERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the erection of a TELESCOPIC GASHOLDER and STEEL TANK, 72 ft. 6 in. diameter, and 14 ft. deep.
The Drawings and Specifications may be seen at the Offices of H. E. Jones, Esq., C.E., Commercial Gas Company, Stepney, or at the Gas Offices, Wokingham.
Sealed Tenders, endorsed "Gasholder and Tank," and addressed to the Town Clerk, Wokingham, Berks, to be sent in not later than Monday, the 29th inst.
The Committee do not bind themselves to accept the lowest or any Tender.

A. G. BATES,
Manager and Secretary.

Gas Offices, Wokingham,
Jan. 12, 1900.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, FIRE-CLAY, &c., required at the Gas-Works during the current Twelve Months.
Forms of Tender may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.
Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five p.m., on Thursday, the 25th day of January, 1900.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
Jan. 13, 1900.

BOROUGH OF WIDNES.

THE Widnes Corporation are prepared to receive TENDERS for the supply of FIRE-CLAY, CLAY RETORTS, BLOCKS, and BRICKS.
Specifications and Forms of Tender may be obtained from Mr. Isaac Carr, M.Inst.C.E., Gas-Works, Widnes.
Tenders, endorsed "Fire-Clay Goods," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than the 5th prox.
The Corporation do not bind themselves to accept the lowest or any Tender.

H. S. OPPENHEIM,
Town Clerk.

Town Clerk's Office,
Widnes, Jan. 11, 1900.

COUNTY BOROUGH OF HALIFAX.

TO IRONFOUNDERS, ENGINEERS, &c.

THE Corporation of Halifax are prepared to receive TENDERS for the supply and erection of CAST-IRON CISTERN and TOWERS for the new Section of their Gas-Works, Mulcture Hall Road, Halifax.
Specification, Form of Tender, and Prints may be obtained on application to Mr. Thomas Holgate, M.Inst C.E., Gas Engineer, Halifax, upon payment of a deposit of One Guinea, which will be returned on the receipt of a *bonâ-fide* Tender.
Tenders, endorsed "Tender for Balcony, Cistern, &c.," must be sent to the undersigned before Ten o'clock a.m., on Wednesday, the 24th of January, 1900.
The person whose Tender is accepted will be required to observe the Fair Contracts Clauses adopted by the Corporation.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
KEIGHLEY WALTON,
Town Clerk.

CORPORATION OF ILKESTON.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the following Plant, to be delivered and erected at their Works, Rutland Street, Ilkeston:—
1. MECHANICAL WASHER-SCRUBBER, to pass 750,000 cubic feet per day.
2. ROTARY EXHAUSTERS, 30,000 cubic feet per hour.
3. COAL UNLOADING AND CONVEYING MACHINERY.
Second-hand Plant for Nos. 1 & 2 will be considered.
Sealed and endorsed Tenders must be deposited with Wright Lissett, Esq., Town Clerk, on or before Jan. 31, 1900.
The lowest or any Tender will not be necessarily accepted, and in any case will be subject to the approval of the Local Government Board, and the usual conditions as to the Standard Rate of Wages.
Full Particulars can be obtained from

F. C. HUMPHRYS,
Engineer and Manager.

Gas-Works, Ilkeston,
Jan. 5, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.
He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.
Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £2800 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Tuesday, the 30th of January, 1900, at Two o'clock, in Lots,
£2800 OF NEW ORDINARY STOCK IN THE ABOVE UNDERTAKING,
Ranking for a Standard Dividend of 7 per Cent., subject to the Sliding-Scale; the last Dividend on similar Stock in the Company having been 12½ per cent.
Particulars of the AUCTIONEER, as above.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

£2500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK AND 500 £10 SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 30, 1900, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

NEW ISSUE OF £7000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 13, 1900, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CRYSTAL PALACE DISTRICT GAS COMPANY.

SALE BY TENDER OF £20,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £150 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL, BY TENDER, £20,000 of FIVE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the provisions of the Crystal Palace District Gas Act, 1893 (56 and 57 Vic.).

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Thursday, the 18th day of January, 1900.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower price than at the rate of £150 money for each £100 Debenture Stock.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works: Lower Sydenham, S.E.,
Dec. 15, 1899.

HARTLEPOOL GAS AND WATER COMPANY.

IMPORTANT SALE OF SHARES.

TO be Sold by Auction, at the Company's Offices, Middleton Road, West Hartlepool, on Thursday, the 25th day of January, 1900, at 3.15 p.m., precisely,

J. W. CROSBY, AUCTIONEER,

500 SHARES OF £10 EACH,

Maximum Dividend limited to 7 per cent. per annum), being part of the Gas Capital authorized to be issued by the Hartlepool Gas and Water Act, 1878, and required by Section 9 of that Act to be offered to the public for Sale by Auction.

The above Shares will be entitled to Dividend from the 23rd day of February next, and to be registered in the name of the Purchaser without charge.

A Deposit of 10 per cent. will be required to be paid at the time of Sale; the remainder to be paid on or before the said 23rd day of February.

The Shares will be sold in Lots of Ten each.

By order of the Directors,
W. SCOTT,
Secretary.

Hartlepool Gas and Water Company's Office,
West Hartlepool, Dec. 14, 1899.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., LD.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., LD.
QUAYSIDE, NEWCASTLE-ON-TYNE.

NOW READY.
Demy Octavo, 172 Pages, Bound in Dark Blue Cloth, Lettered, Price 6s., post free,
THE
"POWERS OF CHARGE"
of the
METROPOLITAN GAS COMPANIES:
A HISTORY OF THE QUESTION OF PRICE IN LONDON
FROM THE INTRODUCTION OF GAS LIGHTING TO THE PRESENT TIME.
BY
LAURENCE W. S. ROSTRON,
M.A., B.C.L.,
Of New College, Oxford, and Lincoln's Inn,
BARRISTER-AT-LAW.
WITH A PREFACE BY
GEORGE LIVESEY, M.Inst.C.E.
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER NOACK, AND CO., HAMBURG.

HARDMAN & HOLDEN, Limited,
ESTABLISHED 1820.
SULPHURIC ACID.
GUARANTEED absolutely free from Arsenic, and of excellent purity. Specially prepared for Sulphate of Ammonia Manufacturers.
WORKS: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
HEAD OFFICE: Miles Platting, MANCHESTER.
Inquiries Solicited.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

SANDELL'S
Gas Companies' Account Books.

The Gas Companies' Expenditure Journal.
With Printed Headings and Analyzing Guide, for keeping the Expenditure of Gas Companies upon the easiest and most correct method, and in accordance with the provisions of the Gas-Works Clauses Act of 1871. Size: 16½ in. by 17½ in.
Price: Half-bound, Cloth Sides, Two Quires, 36s.; Three Quires, 45s.
This Book and its predecessor (on the same principle have been in use since 1867.

The Gas Companies' Rental-Book.
A companion Book to above, with Printed Headings and Illustration, for keeping the Consumers' Accounts with Gas Companies on labour-saving principles. Compact and Precise. A boon to Secretaries, Accountants, and Auditors.
Size and Price as above.
Consumers' Names are only written once in every two years by this system.

The Analyzed Wages Book.
Compiled for use in conjunction with the above Expenditure Journal, with Printed Headings, and adapted to the form for making up the Annual Accounts under the provisions of the Gas-Works Clauses Act, 1871. Size: 15 in. by 10½ in.
Price: Half-bound, Cloth Sides, Two Quires, 15s.
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

D. HULETT & CO., LIMITED.
Show-rooms and Offices: 55 & 56, HIGH HOLBORN, LONDON.
Lamp & Meter Works: HARPUR MEWS, THEOBALD'S ROAD, LONDON.
MANUFACTURERS OF
OUTSIDE GAS-LAMPS
Suitable for Incandescent or Ordinary Burners.
DRY GAS-METERS, SERVICE-CLEANSERS, &c., &c.
PRICE LISTS ON APPLICATION.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

OSLER,

BIRMINGHAM.

MANUFACTURERS OF GASELIERS IN GLASS AND METAL.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

LONDONDERRY GAS COALS

FROM THE

LONDONDERRY COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR,

COUNTY OF DURHAM.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

WELDON MUD

FOR

GAS PURIFICATION,

For use in the

RECOVERY OF SULPHUR,

ALSO

Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:

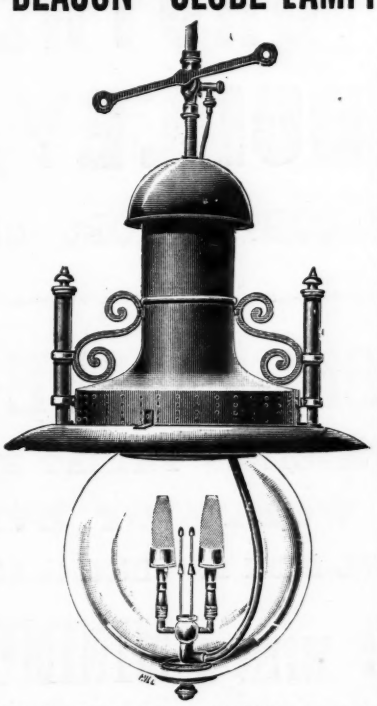
GAS DESULPHURIZATION CO.,

— LIMITED, —

1, FENCHURCH AVENUE, LONDON, E.C.

THE PATENT

"BEACON" GLOBE LAMP.



As fitted at London Bridge near Railway Approach; three Lamps giving the Illuminating Power of 600 Candles. See Surveyor's Report as published in the "*JOURNAL*" for Jan. 10, 1899.

H. GREENE & SONS, Ld.

Late of Cannon Street,

19, FARRINGDON ROAD, E.C.

Telegrams: "LUMINOSITY, LONDON."

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY,

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

THOMAS TURTON

AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,

for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

THE

"KITSON" LIGHT

A SYSTEM OF BURNING VAPOURIZED PETROLEUM WITHIN AN INCANDESCENT MANTLE.

A Light of 1000-CANDLE POWER produced at a cost of less than

ONE PENNY PER HOUR.

STREET-LAMPS—Self-Contained Plant, easily fixed, no tearing up of Thoroughfares.

INSTALLATIONS for Works, Factories, Warehouses, Railway Stations, and Sidings.

SPECIAL TERMS TO GAS COMPANIES.

FOR PRICES AND PARTICULARS, APPLY TO THE

KITSON LIGHTING & HEATING SYNDICATE, Ld.

1, VICTORIA EMBANKMENT (New Bridge Street), LONDON, E.C.

REGISTERED OFFICE: 137, Victoria Road, DARLINGTON.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

Telegraphic Address: "PARKER, LONDON."

GIBBONS BROTHERS, LIMITED,

Telegraphic Address: "GIBBONS, DUDLEY."

DUDLEY,

Telephone: No. 8013.

GAS ENGINEERS, CONTRACTORS, RETORT SETTERS.

Patent REGENERATIVE SETTINGS,

GIBBONS & MASTERS' PATENT No. 1269, 1893.

SUITABLE FOR WORKS OF EVERY CAPACITY,

AND A SPECIAL FORM OF WHICH IS APPLICABLE TO

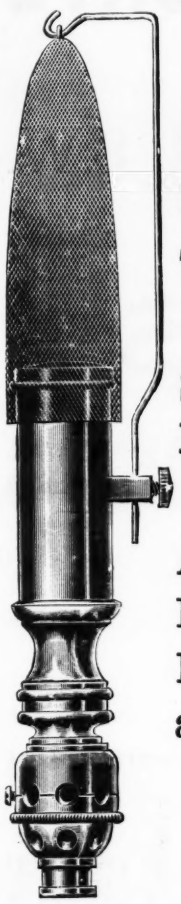
GASEOUS FIRING WITH A MINIMUM EXCAVATION.

RETORT-BENCH IRONWORK, CONDENSERS,

SCRUBBERS, PURIFIERS, VALVES, &c.

DESIGNS AND ESTIMATES ON APPLICATION.

THE
INTENSIFIED GAS LIGHT COMPANY, LTD.



HIGH-PRESSURE PATENTS.

300 CANDLES PER BURNER

Three Burners consuming 30 cubic feet per hour give a Light of 1000-Candle Power at half the cost of Electric Light.

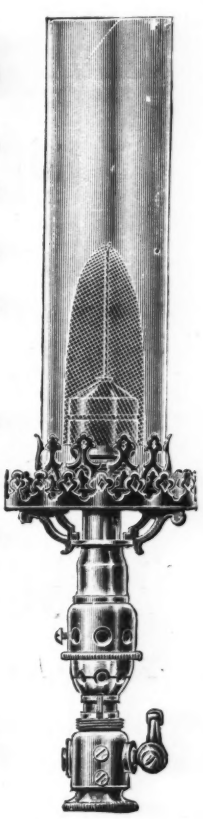
Specially adapted for Lighting Railway Stations, Docks, Sheds, Workshops, Streets and Squares, Shop Windows, &c., &c.

Adopted by the L. & N.W. and Great Central Railways at their Euston and Marylebone Termini, the Crystal Palace, London Pavilion, Mersey and Leith Dock and Harbour Boards, Edinburgh and Leeds Gas Committees, &c., &c., &c.

Specially Low Terms to Gas Companies for Trial Installations.

"The perfection of artificial lighting on the large scale."—"*Journal of Gas Lighting*," April 18, 1899.

ORDINARY GAS PRESSURE PATENTS



The Intensified Company's Improved Incandescent Burner gives **25 CANDLES PER FOOT**, or 60 Candles for $2\frac{1}{2}$ feet. No other Burner on the Market can compare with this. Price, with Mantle and Chimney, from 6s. 6d. Send for Complete Lists.

The most Effective and Economical Burner on the Market for both Indoor and Outdoor Lighting. Mantles specially manufactured for the Company, for both Systems, by the Welsbach Incandescent Gas-Light Company.

For full Particulars apply to the Company's Works—

3. WILSON ST., DRURY LANE,
LONDON, W.C.

THE

DENAYROUZE LIGHT SYNDICATE

LIMITED,

28, VICTORIA ST., WESTMINSTER, S.W.

THE PIONEERS

OF INCANDESCENT BURNERS

WITHOUT CHIMNEYS.

The "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming 3½ feet of Gas per hour. Having an efficiency of 25-Candle Power per Cubic Foot of Gas consumed, it is not only the BEST but CHEAPEST Intensive CHIMNEYLESS Burner on the Market.

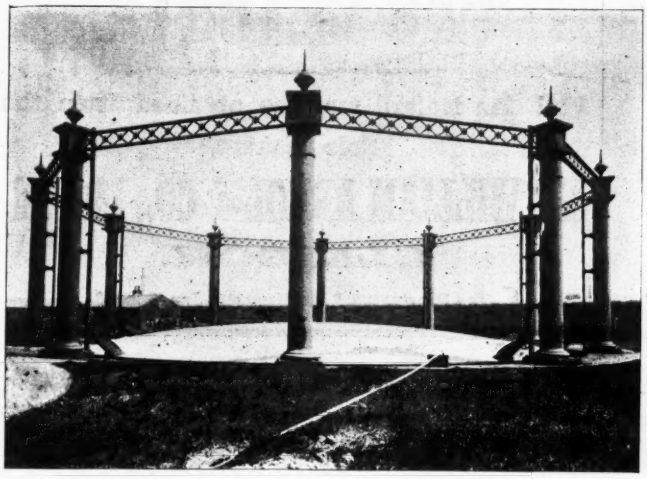
PRICE COMPLETE WITH MANTLE

4s. 9d.

All other Burners supplied by the Syndicate proportionately Reduced from January 1, 1900, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

NOTE—THE DENAYROUZE LIGHT SYNDICATE has carried out the work in connection with all the Installations of Van Vriesland's Oil Gas in England, together with the entire work and fitting of the Grand Exhibit in North West Gallery for the Gas and Allied Trades Exhibition to be held at the Royal Aquarium, Westminster, from Dec. 21, 1899, to Jan. 23, 1900, where all their Burners can be seen in operation.

GASHOLDERS



A GASHOLDER

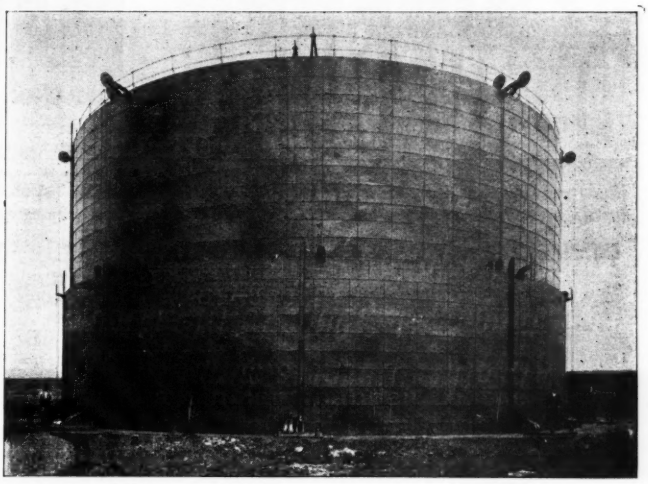
Guided by Ten massive Cast-Iron Columns and Girders is shown in the accompanying Photo.

AS IT WAS

originally erected by us

IN 1883.

We have this year taken down the Guide Framing, converted the Holder into a Two-Lift; and this Photo. ☛ shows it



AS IT IS NOW

entirely guided by our Patent Steel Cable System.

In many other instances, Columns have been sold and replaced by our Cables.

We are prepared to alter any Holders in a similar manner to the above. Engineers who have trouble with the irregular working of Column-Guided Holders will find the Cable System vastly superior and quite reliable.

PATENTEES AND SOLE MANUFACTURERS:

ASHMORE, BENSON, PEASE, & CO., LTD.

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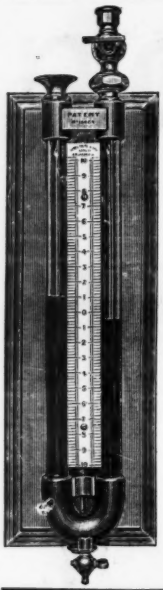

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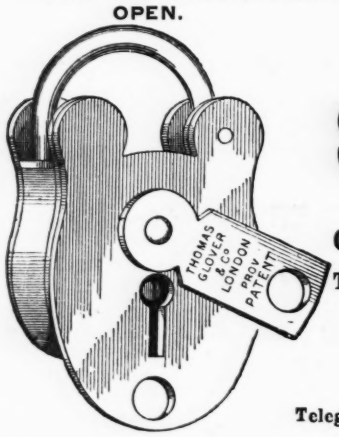

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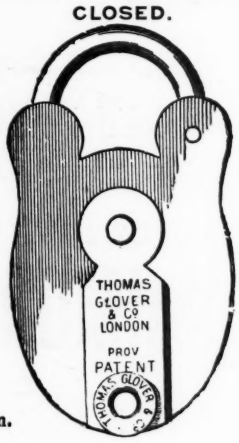

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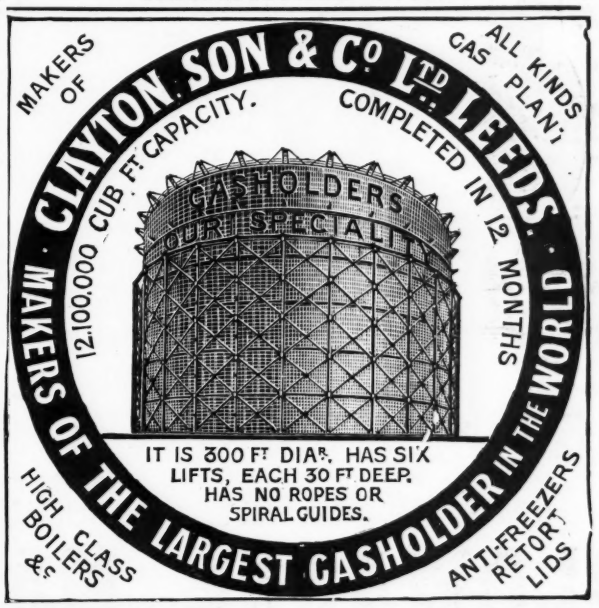
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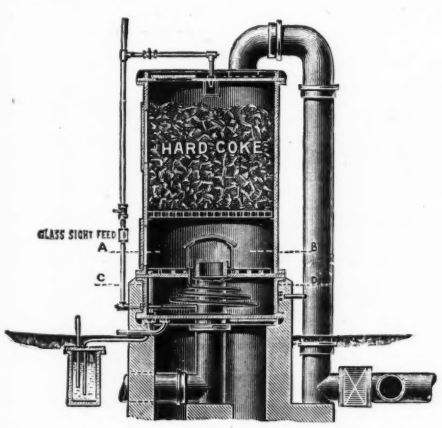

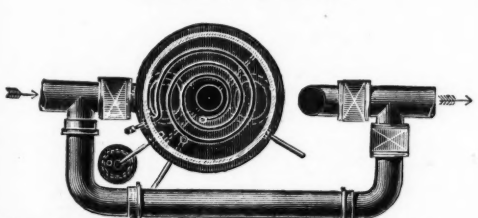

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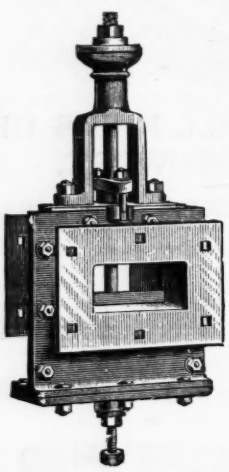

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